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EDITORIAL NOTES

RESEARCH AND THE COKE OVEN INDUSTRY

PRIOR to the war the need for a greater measure of research in the coke-oven industry was emphasized by successive Presidents of the Coke-Oven Managers' Association, and stress was laid on the importance of increasing its contact with the larger organizations whose sole object is research on a national scale, and of fostering and strengthening co-operation with the Gas Industry. There is a similarity in engineering and chemical technique in the two industries which makes obvious the benefits to be gained by co-operation between them. Five years ago the sum set aside for research and development by the coke oven industry—including contributions made by the iron and steel industry and also a grant received from the Government—amounted to less than one-tenth of a penny per ton of coke produced; and in spite of exhortations, suggestions, and recommendations we do not think that the position was materially better at the outbreak of the present war.

The situation regarding research in the coke oven industry will, however, have to be faced squarely, and we must emerge from the present conflict with closely-knit plans for the reconstruction period ahead; we have muddled through far too long. For which reason we have been glad to publish a lengthy abstract of Dr. E. W. Smith's recent Address delivered at Sheffield before a joint meeting of the Institute of Fuel and the Midland Section of the Coke Oven Managers' Association. The Address gave rise to a lively discussion, to which we think we did good justice (considering wartime paper restrictions) in our issue of May 21.

"Revolutionary and sudden changes, however good," said Dr. Smith, "would not be economic, and although the inspired output of the genius should not be overlooked . . . the greatest and quickest advances will be made by thoroughly digesting and assimilating co-ordinated current experiences." It is undoubtedly this co-ordination we must have for successful future operation in the carbonizing industries. Dr. Smith considers "research" as being the study and co-ordination of facts and phenomena in order that such study may lead to the elucidation of problems, the development of processes, the reproducibility of results, and the establishment of basic data; "academic research" as that branch of research divorced from the immediate problems of industry and usually carried out in the laboratory of a university or similar institution. We agree with him that all research should be "fundamental" but hardly like his term "divorced." It seems to us that there should be a closer liaison between the academic research worker and the industrial research worker. Where this has been established, great progress has been the outcome and a better atmosphere has been created. Maybe in the past research was apt to be the "toy of an *otherwise* [our italics] successful undertaking"; we cannot think that this state of affairs exists to any appreciable extent to-day. Successful undertakings in the Gas Industry have certainly realized that a large part of their success has been and is directly attributable to research and its economic application. We could quote instances where the elucidation of seemingly complex problems in the laboratory has literally saved millions of pounds in the working results of gas undertakings.

Dr. Smith expressed the opinion that the organization of research is not sufficiently comprehensive, and not sufficiently systematized for the fuel industry as a whole. We ourselves have had occasion to comment several times on overlapping of research—which necessarily implies wastage of time, money, and the application of trained scientific minds. And, in common with us, he has no patience with those who suggest that because there is a war on research on fuel problems should go by the board, and discussion of future fuel policy should be left till the return of peace. There can be no risk of interference with the war effort by planning now to put our house into a more rational order.

We have suggested that there should be closer liaison between academic and industrial research worker, and we were interested in Dr. Smith's remarks that one of the weaknesses of most research committees is that the chemists and other technicians who are in charge of the actual research are not sufficiently in touch with the operations of the industry. It is certain that if research workers are to be fully effective they must know thoroughly the industry in which they are working or the industry to which the results of their work are destined to be applied. Speaking specifically of the coke oven industry, Dr. Smith expressed the view that right now the industry might well appoint a small committee to prepare a scheme for the comprehensive organization of research for the industry as a whole, bearing in mind the facilities that already exist through the Gas Research Board, the British Coal Utilization Research Association, and other existing bodies. Its chief function would be to determine the extent to which co-ordination could be brought about. Mr. C. J. Bradley, of the Coke Oven Managers' Association, backed this up in the course of the discussion which ensued. For too long, he said, the coke oven industry had been the Cinderella of the coal industry, with the result that there had not been the progress in it there should have been. The whole structure of the industry needed to be reorganized; it must be got on to a fundamental basis not only for selling but also for the conduct of research, and a scheme by which it should be run must be devised. We would also call attention to two suggestions put forward by Dr. R. A. Mott. One was that the Association should form, in each of its branches, a research sub-committee. The other was that the whole problem of research is associated with the technical training of the men in the industry; the younger members of the industry should be encouraged—as, indeed, they are being encouraged—to attain a standard of training which would enable them to understand the implications of research.

EMPLOYER AND EMPLOYEE

A CORRESPONDENT has sent us his views on the Essential Work (General Provisions) Order (S.R.& O., No. 302, 1941). The principle, he writes, is sound—the worker must "stay put." But, he adds, in return the employer must be a "reasonably good" employer. With this, of course, no one will disagree. Then he goes on to argue that it is easy to make the employee stay put and that the problem lies in ensuring that the employer is a good employer. It will be gathered that his theme hinges on the question of salaries, about the general and particular aspects of which we have had plenty to say in these columns.

Our correspondent's next step is to consider the attitude of municipal councils to the National Association of Local Government Officers. Local authority employees have the opportunity of belonging to this organization, which, among other matters, has negotiated agreements covering war bonus. Acting according to their lights, he avers, some councils have accepted it *in toto*, others have accepted it in part only, while still others have refused to accept it at all. "As to the employees of companies"—we quote from the letter—"no association exists for their benefit and they are therefore entirely at the mercy of their employers." The underlying thought of this is obvious, but, though we have in the past had much to say ourselves about the general scale of remuneration which the Gas Industry offers,

and often its inadequacy if the best brains are to be attracted to its service, we have rarely heard of the company undertakings being compared to their disadvantage with the municipal. We are looking at the matter broadly; there are exceptions. And has co-partnership, which works so smoothly in the Industry, done nothing to foster a spirit of friendly discussion? Then there are the excellent relations between the Federation of Gas Employers and the National Union of the gas-workers. These relations are close and again friendly.

Now it would seem that what our correspondent would like would be for the N.A.L.G.O. to open its doors for the duration to all public service employees, for the organization to negotiate terms direct with the Ministry of Labour and National Service, for the Ministry to enforce the conditions upon the employers by Order, and for the terms to be retrospective.

Primarily a technical paper, we have long considered that such matters as this are better left to discussion through other existing channels than in our columns. We feel it is very regrettable that dissatisfaction should exist at a time when the Industry particularly needs all the strength and unity it can muster, and for this reason we have aired, without comment, our correspondent's grievance. We are sure it will receive consideration where any genuine cause for it exists.

Direction in Respect of Naphthalene

The Secretary for Mines has, in pursuance of paragraph 3 of the Control of Coal Tar Order, 1941, issued a Direction in respect of Naphthalene which will come into operation on June 9. Under the Direction, no "distiller" or "importer" may dispose of naphthalene except under the authority of a licence. For a definition of "distiller" or "importer" see paragraph 11, S.R.&O. 1941, No. 81, Control of Coal Tar Order, 1941, dated Jan. 20. Naphthalene for the purpose of the Direction is defined as follows: "All grades of naphthalene having a melting point of 50°C. or higher."

Personal

Mr. A. T. WALLINGTON has been appointed Secretary of Messrs. Smith Meters, Ltd., in succession to the late Mr. Lewis Smith.

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Vacancies on the Board of the Colonial Gas Association have been filled by the appointment of Sir ARTHUR ROBINSON, K.C.M.G., as Chairman, and Mr. C. F. BROADHEAD, at present Chief Engineer to the Metropolitan Gas Company of Melbourne, as Managing Director. Mr. Broadhead's appointment dates as from July 1 next.

Obituary

The death has occurred at Hove of Mr. JOSEPH CASH, M.Inst.C.E., in his 96th year. Mr. Cash's connexion with the Brighton, Hove, and Worthing Gas Company extended to 70 years.

Going first to Hove in January, 1862, Mr. Cash was an articled pupil of the late Mr. J. B. Paddon, M.Inst.C.E., the former Chief Engineer of the Brighton and Hove General Gas Company. After serving his articles and acting as engineering assistant to Mr. Paddon, he was appointed Assistant Engineer of the Company, and in 1870—only eight years after joining the Company—was one of those young engineers who were engaged in designing the lay-out of the Portslade Gas-Works. Mr. Cash was concerned with Mr. Paddon in the erection of No. 2 Section in the early 'eighties, when the amalgamation with the old Brighton Gas Light and Coke Company, at Black Rock, made it necessary to increase the productive capacity of the Works. On the retirement of Mr. Paddon from the Engineership in 1885, Mr. Cash was made Engineer and General Manager, a position which he held until 1915, when he was promoted to a seat on the Board, which he retained until his retirement in 1931.

He was also a notable figure in the Parliamentary Committee Rooms and an expert engineering witness, and he was well known in the Industry as a consulting engineer and in rating cases. Mr. Cash was also Consulting Engineer to the Southampton Gas Company for many years, and at one time was Chairman of the Chichester Gas Company.

* * *

The Directors of Sidney Flavel and Co., Ltd., regret to announce the death on May 29 of Mr. G. WESTLEY, Secretary of the Company. Mr. Westley began work in the Costs Department seventeen years ago, and by his ability and conscientious devotion to duty earned the respect and admiration of all who knew him. He was appointed Secretary in 1933.

A Satisfactory Year has been experienced at Peterborough, notwithstanding the many difficulties brought about by abnormal conditions. This is stated by the Directors of the Peterborough Gas Company in their report for the twelve months ended March 31. A dividend of 7½% on the ordinary stock will leave a balance of £12,310 at credit of Profit and Loss Account.

Letter to the Editor

Advertising in Wartime

SIR,—It is generally agreed that in the interests of the nation and the Industry there should be no national publicity at the present time which might stimulate the sale of gas or gas appliances but, even so, some are concerned—and references in the Technical Press have shown evidence of this—as to whether the B.C.G.A. should not have advertisements of a prestige or goodwill nature in the papers.

This question has received most careful consideration on more than one occasion by the Executive Committee, who have reached the conclusion that a temporary cessation of national advertising will best serve the interests of the Industry.

At the time when the nation is urged to economy, it is believed the public would prefer to see an appropriation for advertising spent upon the maintenance of the most reliable service we can provide under total war conditions, at the lowest possible cost. It is, therefore, in the direction of service to the consumer that the Executive Committee believe that time and money can most profitably be spent in present circumstances. Moreover, the Joint Gas and Electricity Agreement places restrictions upon advertising by the national gas and electricity supply organizations.

The Association's wartime activities are, therefore, largely directed to the assistance of members locally. Publications dealing with the consumers' wartime problems are issued and meet with a regular demand from members. The Association's Studio is lending growing aid to members to maintain attractive showroom window and interior displays and frequently supplies suitable material to link up with special local "war effort" campaigns. Local advertisements are prepared for members for special occasions. Editorials prepared by the Association on a wide variety of subjects have been freely published by the Press, both through our members and direct from the Association. Information is given to enquirers on matters associated with the commercial side of the Industry; as an instance of this there is our national List of Gas Filling Stations for Motor Transport. Our Film Library is issuing films which have told the story of gas to audiences totalling well over a million people during the past twelve months. The Ministries of Information and Food both include a large number of copies of our films in their libraries. Our films are thus included in official film programmes throughout the country.

The Association watches every opportunity for supporting the public relations work of Government Departments. Examples of this are the Ministry of Food Education Campaign; the Salvage Campaign conducted by the Salvage Controller; and the official Window Display Scheme of the Ministry of Information.

Care is also taken to ensure that Government Departments and official and voluntary organizations, of which there are so many of wartime growth, are kept fully informed regarding the contribution that gas makes to many aspects of their work.

The Association is preparing too for the post-war period. We are mindful that it is hardly likely that we shall return to our pre-war economic, social, and political life, and that there is need to envisage a changed national outlook which may make new demands and impose new conditions on our Industry. A strengthening of the Association's constitution to meet these probable post-war changes—particularly with regard to a more active and responsible district organization—is both necessary and desirable, and plans are accordingly taking shape.

These are in the main the essential functions of the Association in wartime. I feel confident they will commend themselves to the readers of the "JOURNAL" as representing the activities in which the Association can most profitably engage on their behalf until the return of peace.

Yours, &c.,
W. J. SANDEMAN,
Chairman of the
Executive Committee.

British Commercial Gas Association,
1, Grosvenor Place, S.W. 1.
May 26, 1941.

Associated Gas and Water Undertakings, Ltd.

Ordinary General Meeting

The Eighth Ordinary General Meeting of Associated Gas and Water Undertakings, Ltd., was held on May 28 at the Registered Office, 2, Chart Lane, Reigate, Surrey.

Mr. W. H. BENNETT, Chairman of the Company, said: The report and accounts have been in your hands during the statutory period, and, with your permission, we will take them as read.

It has been the practice at our annual meetings to review not only your Company's finances, but the activities and development of the public utility undertakings from which it derives the greater part of its revenue.

Recently the Government, by an Order under the Defence Regulations, prohibited the publication of statements of accounts and Directors' reports of gas and electricity undertakings. Despite the fact that the accounts of our subsidiaries for the year 1940 had been published before the embargo, I am sure you will agree that I should act within the spirit of the Order, which is intended to prevent information of value reaching the enemy. Consequently, I propose to depart from our usual practice and simply say that the Companies which form our group have experienced the anxieties and difficulties which are common to all trading concerns under war conditions. How those difficulties have been satisfactorily surmounted may be

judged by reference to the revenue account, to which I call your attention.

Revenue Normal

The dividends received amounted to £112,418, a reduction of £5,183 compared with the previous year. This is largely due to the inequitable operation of the "sliding scale," as applied to statutory gas undertakings, by which the permitted dividend is reduced as the charge for gas is increased. Increased revenue has been derived, however, from a full year's receipts from freehold properties acquired in 1939, from new ones purchased in 1940, and from increased services rendered to our subsidiaries and other companies. The result is that the gross revenue from all sources fell short of that for the year 1939–40 by only £726.

With regard to expenditure, increased taxation, discount on Debenture Stock, and War Damage Insurance, coupled with larger amounts written off investments and leasehold property (now standing in our books at the nominal figure of £1), reduce the net divisible profit to £63,758, as compared with £74,574 for 1939–40.

This amount is sufficient to provide for the Preference dividend and a distribution of 6¼% upon the Ordinary shares, but having regard to present conditions your Directors recommend adherence to the rate of 5% which has been paid since the inception of the Company. This will absorb £55,147 and increase the sum carried forward by £8,611 to £41,162. This sum is equal to nearly 1¾ years' Ordinary dividend at the current rate, forming a useful reserve against any vicissitudes which may occur in the future.

The balance-sheet calls for little comment. The issued share capital at £2,329,799 remains unaltered, while investments (less amount written off but including the cost of acquiring direct control of the Langport, Huish, and Curry Rivel Gas Undertaking) at £2,961,535 show an increase of only £1,359. Cash at bankers has increased to £29,020, and as little opportunity for extension of the Company's activities is likely to present itself during the war, your Board has, since the close of the year, invested the greater part of this sum in new Government loans, an action which I know will meet with your approval.

Results such as those shown in the accounts now before you could not have been achieved without the loyalty and enthusiasm not only of the officers and staff at headquarters but of the local Directors, officers, and all the employees of our subsidiary companies. I wish to tender our sincere thanks to them for all they have done, and are continuing to do, in the interests of this Company.

The report and accounts were unanimously adopted.

South-Western Gas and Water Corporation

Ordinary General Meeting

The Seventh Ordinary General Meeting of the South-Western Gas and Water Corporation was held in London on May 8, Mr. R. B. H. OTTLEY (Chairman of Directors) in the Chair.

The CHAIRMAN, in a speech previously circulated to the shareholders, said: Your Board of Directors is very satisfied with the result of the year's working in practically all the Companies in which the Corporation is interested. Not unnaturally, war conditions have confronted us with difficulties that we should not have met with in peace conditions, but our staffs, with the advice and assistance of Mr. Allen, our General Manager, have proved again and again that difficulties are only there to be surmounted. Our business has largely increased and we have been able to satisfy the requirements of all new demands. The net revenue from our subsidiary undertakings has increased from £29,946 in 1939 to £32,322 in 1940, and Directors' fees receivable from £9,179 to £10,336. Alas, the dividends from our investments, our unhappy heritage to which I referred last year, have shrunk from £7,821 to £5,759 in the same period. Our total revenue is shown at £48,907 in 1940 as compared with £48,196 in 1939. In these anxious days it is difficult to peer into the future, but in the absence of any unforeseen misfortunes your Directors look forward to being able to show you results at least as favourable for the year 1941.

The Report and Accounts were adopted, and the meeting confirmed the payment of the dividend at the rate of 4½% per annum on the 4½% Redeemable Cumulative Preference Shares for the year ended December 31, 1940, and the payments on October 18 last of the interim dividend of 2% less Income Tax on the Ordinary Shares.

A final dividend on the Ordinary Shares of 3% less Income Tax at 10s. in the pound, payable on May 20, was declared.

Mr. S. J. Ingram and Mr. J. M. Whittington were re-elected Directors of the Corporation, and Messrs. Deloitte, Plender, Griffiths & Co., Chartered Accountants, were re-appointed Auditors for the ensuing year.

Captain W. J. LIBERTY proposed a hearty vote of thanks to the Chairman, the Directors, and the Staff, for their services under the very difficult and trying circumstances of the past year.

The CHAIRMAN: On behalf of my colleagues on the Board, and the Staff, I thank you very heartily for your appreciation, and I will see to it that your sentiments are conveyed to the whole of the staff.

The Annual General Meeting of the Chemical Engineering Group of the Society of Chemical Industry was held at the Waldorf Hotel, London, on Wednesday, May 21, under the Chairmanship of Mr. H. W. Cremer. The annual report of the Committee showed a satisfactory state of affairs and a pleasing increase in the membership during the past year. It was decided not to make any changes in the Officers and Committee for the coming year. A luncheon followed, at which the speaker was Lord Reith, who discussed post-war planning and some of the possible changes which were to be anticipated.

Institution of Gas Engineers

Programme of Annual General Meeting, Wednesday, June 11

10 a.m.

1. Secretary (W. T. K. Braunholtz) to read the Notice convening the 78th Annual General Meeting of The Institution of Gas Engineers at, and by kind permission of the President and Council of, the Institution of Mechanical Engineers.
2. Confirmation of the Minutes of the 76th Annual General Meeting.
3. President to move:
   (*a*) "That the 77th Annual Report of the Council of The Institution of Gas Engineers for the year 1939–40 and the Accounts for the year 1939, which have been printed and circulated to members, be taken as read and adopted." (*Communication No.* 228)
   (*b*) "That the 78th Annual Report of the Council of The Institution of Gas Engineers for the year 1940–41 and the Accounts for the year 1940, which have been printed and circulated to members, be taken as read and adopted." (*Communication No.* 238)
4. To receive the report of the Scrutineers of the Ballots for the election of:
   (*a*) Officers, Auditors, and Ordinary Members of Council.
   (*b*) Honorary Members, Members, Associate Members, and Associates.
5. To report the names of the District Members of Council nominated by the affiliated District Gas Associations of the Institution for the year 1941–42.
6. Appointment of Scrutineers of the Ballots for the election of:
   (*a*) Officers, Auditors, and Ordinary Members of Council.
   (*b*) Honorary Members, Members, Associate Members, and Associates.
7. Presentation of Medals:
   (*a*) Institution Gold Medal, 1940: Awarded to T. R. Cook (Blackpool) for Paper "The New Gas-Works of the Blackpool Corporation Gas Department," published by The Institution of Gas Engineers in May, 1940. (*Communication No.* 230)
   (*b*) Institution Silver Medal, 1940: Awarded to R. L. Greaves (St. Helens) for Paper "Town Gas in the Manufacture and Heat Treatment of Glass," read at the General Meeting of the Manchester District Association of Gas Engineers held at Manchester on Oct. 18, 1940.
   (*c*) Institution Bronze Medal, 1940: Awarded to S. H. Stokes (Hyde) for Paper "The Economic Utilization of Unscreened Coke Breeze," read at the General Meeting of the Yorkshire Junior Gas Association held at Bradford on Feb. 24, 1940.

10.30 a.m.

8. (*a*) Presidential Address by GEORGE DIXON, B.Eng., M.Inst.C.E., Engineer and Manager, City of Nottingham Gas Department. (*Communication No.* 239)
   (*b*) Vote of Thanks for the Presidential Address.

11 a.m. *Adjournment.*

9. General Meeting of the Contributors to the Benevolent Fund of The Institution of Gas Engineers.
   (*a*) Honorary Secretary (W. T. K. Braunholtz) to read the Notice convening the General Meeting of the Contributors to the Benevolent Fund.
   (*b*) Confirmation of the Minutes of the General Meeting held in London on June 7, 1939.
   (*c*) Chairman (George Dixon) to move:
      (i) "That the Report of the Committee of Management of the Benevolent Fund of The Institution of Gas Engineers for the year 1939–40 and Accounts for the year 1939, which have been printed and circulated to contributors, be taken as read and adopted."
      (ii) "That the Report of the Committee of Management of the Benevolent Fund of The Institution of Gas Engineers for the year 1940–41 and Accounts for the year 1940, which have been printed and circulated to contributors, be taken as read and adopted."
   (*d*) Report of the Scrutineers of the Ballot for elections to the Committee of Management for 1941–44.
   (*e*) Vote of Thanks to the Chairman, Committee of Management, and Honorary Secretary of the Benevolent Fund.

Termination of General Meeting of Benevolent Fund.

11.15 a.m. *Resumption.*

10. Presentation and discussion of Symposium of Short Papers on the Gas Industry: 1941 and After. (*Communication No.* 240)

12.45 p.m. *Adjournment.*

11. President's Luncheon at the Savoy Hotel, Victoria Embankment, W.C. 2.

2.45 p.m. *Resumption.*

12. Discussion of Symposium (continued).

4.45 p.m.

13. Vote of Thanks to:
   (*a*) The contributors to the Symposium, (*b*) the Scrutineers of the Ballots, (*c*) the Officers, Auditors, Council, and Committees of the Institution, and (*d*) the Secretary and Staff of the Institution.
14. Vote of Thanks and Presentation of Presidential Certificate to the retiring President, Mr. George Dixon.

"POST-WAR RECONSTRUCTION"

"J.J.C.B.B." discusses the article by a Gas Engineer who "looked forward" in our issues of April 30 and May 7

READING these articles, surely the most thought-provoking that the "GAS JOURNAL" has published for a very long time, sent me back to John Stuart Mill "On Representative Government." I suppose about one-third of the gas supplied in this country is distributed by municipally-owned gas undertakings. These undertakings are managed more or less in detail by gas committees and their chairmen. Speaking generally, these gentlemen do a great many things which no "miscellaneous elected body" should ever attempt to do. Mill says "the proper duty of a representative assembly in regard to matters of administration is not to decide them by its own vote, but to take care that the persons who have to decide them shall be the proper persons. . . . Each executive officer should be single and singly responsible for the whole of the duty committed to his charge. Appointments should be made on the individual responsibility of the chairman of the body . . . he himself being appointed by the council from its own number subject to . . . removal by a vote of the body."

Government Compulsion or Sanction

How very far short of this ideal the average gas committee falls is only too well known, but certainly it is frankly impossible for the poor engineer even to attempt "to apply the results of scientific research" when he is hampered by the interference of elected persons who must, by the very nature of things, be ignorant in this particular respect.

And there will be no "higher standard of personnel" so long as personnel is appointed by the vote of an elected assembly of persons who are quite unqualified to make such appointments. It is possible that it must be left to such an assembly to veto the nomination of the chief executive official after an interview, but the appointment of all subordinate officials should be left to the chief executive, who should be solely responsible to the chairman of the committee. "Above all," says your Contributor, "the prestige of the Industry must be high and the prospects attractive if results are to be obtained." This will never be so as long as salaries and promotion are fixed by little local bodies of elected persons assembled round the parish pump.

In short, we are not going to begin to make any of the progress and development envisaged by your Contributor until the control of the Industry in its main aspects is vested in the hands of some such National Body as he and others have from time to time suggested. As Chantler put it, "that authority could well be a small body of Gas Commissioners, comprising men of proved capacity in gas administration, to be appointed by the President of the Board of Trade, and charged with the duty of promoting gas supply in Great Britain. . . . Even if the internal problems of the Gas Industry did not justify the institution of a planning and directing authority, it is clear that if Great Britain were to adopt a national fuel policy . . . the establishment of an authority with such powers as those suggested for the Gas Commissioners would be necessary. . . . The Gas Industry could not fit into any general fuel policy until it was positively directed."

Nothing less will ensure that technical policy shall be controlled by technical men adequately trained and paid and selected for their ability to make and distribute gas at the lowest possible cost and with the highest possible efficiency.

There will, however, be all the difference between an organization imposed on the Industry by the Government and an organization evolved by the Industry and imposed upon all its constituents with Government sanction. Here is a task worthy of the British Gas Federation and all the best men of the Industry, those with the broadest of minds and the most far-seeing of views, to work out the terms of the Statute for the Incorporation of the British Gas Industry, Ltd.

Geographical Organization

So far, the argument is applicable only to municipally-owned undertakings, though it applies to a less extent to some company-owned undertakings, particularly those with boards composed of men of so advanced an age that their intellects are losing that alertness so necessary to grasp the opportunities of a rapidly developing industry.

It is linked up, of course, with the whole question of local government which is evidently exciting considerable interest just now as, for instance, in the important article in the *Economist* of May 24. "Neither in its structure nor in its system of financing was it (local government) ever designed, even after its remodelling in the nineteenth century," says this article, "to shape the welfare of the nation in a positive way; and changes in communications, in the technique of industry and the public services, in the responsibilities of government and in the distribution of the population have not made it more apt. Many of the units of local government are too small; they lack the resources of finance and personnel to carry out their duties; and, again and again, the boundaries between them have no more than a formal, administrative meaning. The point is that some measure of regionalism is required for local administration at large." The scandal of the division of the responsibility for utility services in a perfectly homogeneous urban district among several authorities who owe their existence to nothing more than the survival of historic boundaries, and which have no other *raison d'être*, is not removed by the operation of the holding companies which so absurdly link together undertakings scattered over the length and breadth of the land. Amalgamation on a geographic basis is the only way to tackle this problem.

Coke or no Coke

The second instalment of this article was more intriguing still. Your Contributor seems to agree that the present combination of gas and coke cannot be the ultimate form in which the Industry should supply refined fuel to the public. Ultimately, the Gas Industry must supply gas only. Even now, if gas is manufactured in sufficiently large units, it can be shown that a considerable reduction in cost can be effected by a combination of the carbonization and water-gas processes in which the whole of the residual coke from the former would be gasified in the latter. In a unit of the order of 5 to 10 million cu.ft. daily capacity gas could be made at a reasonable C.V. for well under 2d. per therm, based on 1936 costs and including capital charges. The coke from the carbonizing plant would be conveyed direct to automatic water-gas generators and completely gasified. Part of the water gas made would be returned to the retort settings for under-firing and the balance mixed with the coal gas. The carbonizing plant should be of a type in which the C.V. of the gas made is readily adjustable.

The day when the Gas Industry will supply methane only seems a long way off, and while one cannot see anything at all impossible in the prophecies made by your Contributor, it is pretty certain that there will be more than one intermediate stage before that consummation is reached.

Finally, I am convinced that your Contributor is absolutely right when he says "that the Gas Industry cannot take advantage of the possibilities open before it unless it becomes a unified business concern"—a vision of "The British Gas Industry, Ltd."

Dunbar Gas Commissioner shave decided to give their staff at the gas-works the full holidays of ten days this year.

Consent has been received by Newark (Notts) Town Council to the raising of a loan of £1,000 for the provision of hire purchase gas appliances.

Sydney is Charged per Unit for its gas, which is supplied by the Australian Gas Light Company, the price per unit being 0.428d. The net profits of the Company for the year 1940 (including the balance of £1,776 brought forward) amount to £220,549. An interim dividend of 2% was paid, and a final dividend of 2½% on the "A" and "B" shares will leave the sum of £1,849 to be carried forward.

Airdrie Town Council Lighting Committee have agreed to take part in the mutual aid scheme for gas undertakings to come into operation in the event of an emergency. At a recent meeting there was read a letter from Mr. James Jamieson, Engineer and Manager of Edinburgh Gas Department, which gave particulars of the scheme. The Committee decided to recommend that the Council co-operate in the scheme, and it was left to the Convener and the Gas Manager to go into the details.

More Gas was Used at Montevideo during the twelve months ended December last, the Montevideo Gas and Dry Dock Company, Ltd., reporting that, as compared with the year 1939, the sale of gas shows an increase of 2.91%, and the number of consumers an increase of 3.65%. A final dividend is recommended of 3%, free of income-tax, making with the interim dividend already paid 4% for the year, and leaving to be carried forward the sum of £85,202.

INDUSTRIAL METERING*

By ALLEN D. MacLEAN

Vice-President and Chief Engineer, Pittsburgh Equitable Meter Company

IN the average gas distributing company, particularly in recent years, the proportion of gas sold to industrial consumers becomes increasingly larger. The many benefits derived from using gas—the ideal fuel—are being appreciated more and more by all types of industries. The growth of "industrial gas departments" and the increased employment of specialized industrial engineers by the gas companies bears witness to this well deserved growth.

In many respects sales of gas for industrial consumption vary greatly from sales to the ordinary domestic or even commercial prospects. In the first place, gas is under direct and continually active competition from other forms of energy, such as oil, coal, electricity, and the liquefied petroleum gases; hence its application must be the most efficient possible. By the same token, measurement of sales to an industrial consumer should be as accurate as possible. Then, too, since manufacturing cost as compiled by the consumer includes the cost of gas, he will be more attentive to the meter and its accuracy. He may even time it for certain periods to check his hourly cost; he may install departmental meters of his own to check various operations. In other words, the average industrial consumer is very conscious of his measurement and he should be provided with accurate and satisfactory metering.

Another respect in which industrial metering differs from domestic is in the size and nature of the load to be measured. Obviously industrial loads will be much larger than domestic ones, but a fact which we sometimes fail to consider is that the average industrial load is more nearly constant than the domestic one. With many domestic consumers, the maximum flow rate may be only a small part of the total connected possible load; as contrasted to this many industrials will operate up to their connected load capacity for many hours at a time. This, of course, has a direct bearing on the meter, its selection, maintenance, &c.

There are many other essential differences between domestic and industrial consumers, such as meter location, pressure of measurement, period of maintenance, period of reading, which tend to put industrial meters in a class quite distinct from the domestic meter.

In some gas companies the problem of industrial meters is handed to the domestic meter shop with the hope that they can in some way spare a little effort from their job of repairing domestic meters to take care of selecting and maintaining industrial meters. In other situations the industrial gas department takes on, in addition to the already arduous job of selling gas, the rather specialized task of supervising industrial measurement. The entire matter of industrial metering is of sufficient importance to the management to see that it is not bounced around between departments. Progressive management makes certain that this important source of revenue is well handled, and that industrial measurement is as accurate as can be provided.

In approaching the problem of industrial measurement, we must survey the types of measuring devices which are normally available. Three general types are used: the orifice meter, the so-called rotary displacement meter, and the diaphragm type positive meter.

The first of these, the orifice meter, is usually used on large loads, where there exists a pressure in the mains sufficiently high so that the pressure loss, incidental to orifice meter measurement, can be permitted. Power plants, steel mills, &c., make up consumers of this type. We do not intend to go into the theory and practice of orifice meter measurements here, except to note the condition under which measurement can be made. As pointed out above, there must be a sufficient pressure to be able to stand the pressure loss (approximately 3 lb.) required in orifice meter measurement. Then, too, the variation between maximum flow rate and minimum flow rate with a simple orifice meter cannot be greater than four to one. If there is any very great sale of gas at a flow rate below one-fourth of the maximum, considerable revenue may be lost. By using a dual meter, which is in effect two recording differential gauges (connected across the same measuring orifice), one arranged to measure the lower differential pressures only, the range of maximum to minimum can be extended to a 7 or 8 to 1 ratio.

Another method of extending measurement range of the orifice meter is to provide several meter runs, each with its own orifice. As the load varies from a minimum, which can be measured by a single run with its meter, to a larger flow rate, the valves of the next run are opened and the load then metered by the two runs, and, of course, added together. Three, four or more runs and meters can be used this way. The opening and closing of the additional runs can be either manual or automatic. If the changes in flow rate can be anticipated, manual shifting of runs with load variation is possible; however, usually the nature of industrial load changes is such that some sort of automatic means for adding and subtracting is required.

The orifice meter will sometimes require considerable explanation to the consumer. He is expected to accept this type of inferential measurement and to pay a considerable bill based on its accuracy. It would seem a good policy for some qualified employee of the gas company to be available at all times to confer with industrial consumers on the theory and practice of the orifice meter, and to go over and explain their measurement and charts to them. A good tactful and polite contact of this type can do a lot for customer relationship. Actually, the job of justifying the accuracy of orifice meter measurement to a consumer has been made very easy by the recent A.G.A.-A.S.M.E. approval of the existing co-efficients. Now co-efficients, the basis of orifice meter measurement, and all the other variables are carefully explained and evaluated in the A.G.A.-A.S.M.E. Committee Report. There should be no basis for any disagreement on measurement providing the orifice meter is kept within its well-defined limitations and the recommended practice as to the physical installations is adhered to.

As stated before, a good customer contact as to measurement is essential to successful industrial metering. To many industrial consumers, the orifice meter offers an important feature in that the chart, on which computation of measurement is based, can be used as a demand meter. Just when the heaviest hour occurred, how much it was—the value of flow during any hour—can be readily determined and often is of considerable value to the customer. In this respect, the integrating orifice meter—that is, one from which the totalized flow can be read on an index—gives the industrial customer a chance, without computing from charts, to check the flow rate at any time. This at times may be an advantage.

In rendering a bill based on the normal orifice meter, the charts which record differential and static pressure are removed from the meter gauge every 24 hours or every week, depending on the clock selected for the job. It would be well occasionally to go over the calculation of these charts with the consumer to be sure that he is well informed of the measurement.

In maintaining orifice meters, a check of the meter should be made at least once a month. The following points should be examined or tested.

1. Make certain plate is of proper size and the edge sharp and clean.
2. Physical factors in the set-up should be checked, such as presence of straightening vanes, proper pressure taps, proper distance between vanes and plates, &c.
3. Time clock which drives chart be checked for accuracy.
4. Check differential recording mechanism with differential U-gauge.
5. Check static coil against a test gauge or dead weight gauge tester.

With proper maintenance and computation the orifice meter makes an excellent accurate instrument for loads within its limitations.

The rotary displacement meter has found some acceptance in industrial metering, particularly for larger flow rates where there is not sufficient pressure to employ the orifice meter. The principle of measurement is well known. This type of meter provides accurate measurement when applied properly. It has a certain limitation at low flows, in that clearances for operation must be provided between the impeller and side walls and between the impellers themselves. The range of flow rate between maximum and minimum is variously given as between 10–1 and 20–1. It is possible to use a tandem construction, automatically operated to permit the low flows to be measured by a diaphragm type positive meter. At higher flows the diaphragm meter is automatically by-passed.

The final group of meters to be discussed is the positive meter of the diaphragm type. This instrument employs the same principle of measurement as is used on the familiar domestic meter. However, there are some essential differences in design, application, testing, and maintenance which can be discussed at this time.

In discussing industrial measurement with the diaphragm

* From a Paper at a Conference of the American Gas Association, Technical Section.

type meter there arises a very natural division of the two groups, the high pressure group and the low pressure group. Wherever it is possible to serve an industrial consumer directly from a high pressure or medium pressure line, it is almost always the custom to do so. There are very many economies affected by serving gas in this manner. In the first place, because the gas is denser at high pressure, more gas can be sold to the consumer through a smaller meter installation. Then, too, if the industrial consumer receives the gas at high pressure, he can transmit it to any part of his plant in sufficient quantities and at a sufficient pressure to obtain the kind of combustion he wants. Often the use of boosters and other devices to raise the normal low distribution pressures to a satisfactory combustion pressure for the industrial burner will cause a very heavy draw on the low pressure system and, of course, is expensive. When gas is served at high pressure, this type of pressure boosting is not necessary.

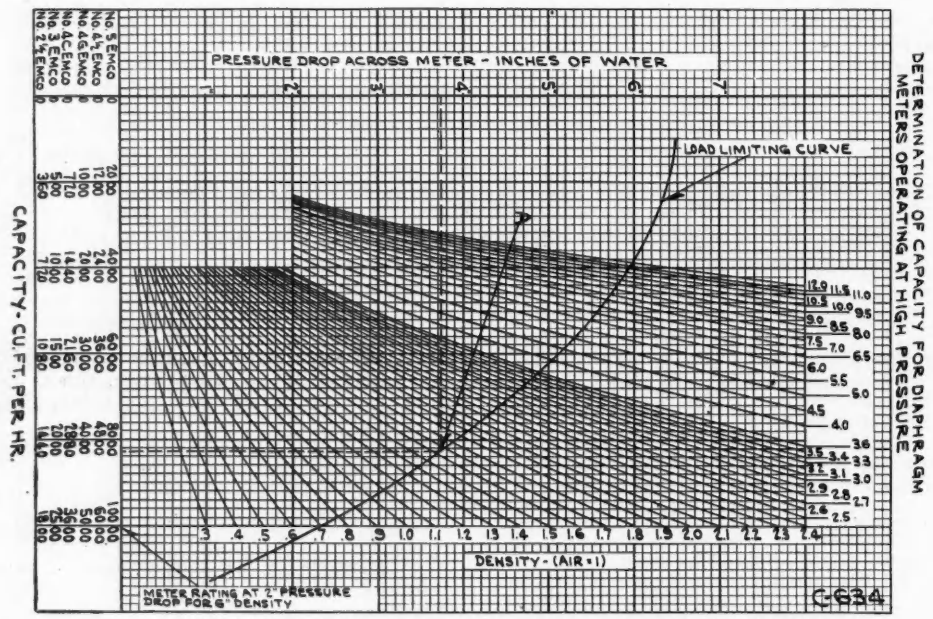
The first obvious requirement of a meter to measure gas at high pressure is that it will withstand the gas pressure safely without bursting and without leaks, and for this reason all

$$Q = K\sqrt{\frac{h}{G}}$$

where—

Q = rate of flow in cubic feet per hour displacement, that is, dial speed.
K = a constant depending upon the meter or whatever the resistance is.
h = the pressure loss, usually expressed in inches of water, and—
G = the density of the gas compared to air at atmospheric pressure as being 1.

If we examine this formula we see that if we increase the flow rate Q while we hold the density of the gas G constant, to balance the equation we must increase the pressure loss h. If we double the flow rate Q we must increase h by four times since it is under the square root sign, or to put it another way, the pressure loss varies as the square of the flow rate through the meter. Let us assume, however, we maintain the flow rate the same but vary


PRESSURE DROP ACROSS METER - INCHES OF WATER
LOAD LIMITING CURVE
CAPACITY - CU. FT. PER HR.
DETERMINATION OF CAPACITY FOR DIAPHRAGM METERS OPERATING AT HIGH PRESSURE
DENSITY - (AIR = 1)
METER RATING AT 2" PRESSURE DROP FOR .6 DENSITY
C-634

CURVE FOR DETERMINING THE CAPACITY OF HIGH PRESSURE METERS

industrial meters for this type of service are of iron or steel. The cases are carefully tested and sufficiently generous gasket joints provided so that the meters are safe. The principle of operation of these meters for high pressure measurement is the same as the small two diaphragm slide valve domestic meter. However, there is an essential difference which the industrial meter man must recognize. The domestic tin meter, always intended to operate on low pressures, does not have a heavy case and is in effect a series of tin surfaces soldered together. The density of the gas is always less than 1 and, therefore, in handling any given number of cubic feet displacement, the loads applied on the meter parts are not excessive. It might be well here to digress a minute to study actually the load on a meter in measuring gas at various flow rates and in measuring gases of various densities. It has been the custom for a number of years to rate domestic meters in "lights." For instance, a 5-light meter on the present standards is said to pass 150 cu.ft. of 0.6 gravity gas per hour with a loss in pressure across the meter not to exceed 0.5 in. of water. This rating we have inherited from the old days, when the main load on a meter was gas lights. Gas lights were rather sensitive to pressure variations, and since the operator did not wish to absorb too much pressure in his meter, the meter was rated as the number of lights it would carry without an excessive pressure loss. The pressure loss across the meter in operation is caused by two factors: First, the actual flow rate, and second, the density of the gas. In general the flow through a meter follows the formula of the flow of gas through any orifice which can be written as follows:

the density of the gas, that is, vary the value of G. If we maintain Q constant and double the value of G, to satisfy the equation we must double the value of h. In other words, for any given dial speed of the meter the pressure loss across the meter varies directly as the density. For a given gas the density will vary directly as the absolute pressure, and hence we have our pressure loss across the meter varying directly as the absolute pressure for any gas. This means if we operate an industrial meter at a dial speed of 5,000 cu.ft. per hour on a gas of 0.6 gravity, we will get a pressure loss of, let us say, 1 in. w.g. across the meter. By compressing this gas to approximately 15 lb. we will increase this density from 0.6 to 1.2, and we will cause a pressure loss then at a dial speed of 5,000 cu.ft. per hour of 2 in. of water. If we should increase our measuring pressure to approximately 45 lb. we would increase our density by four times, and for the same dial rate of the meter we would increase our pressure loss from 1 in. to 4 in. Please note that in this case we use the word "dial rate" rather than cubic feet. Although cubic feet of displacement remains the same, the cubic feet of gas reduced to a base pressure, of course, will be much greater in these last two cases. It is on this point—that is, high pressure loss across a meter as the density of the gas is increased by higher pressures —that the main difference between the average tin meter and the iron or steel meter is found.

To take advantage of the design of high-pressure meters and be able to rate them for capacity under various conditions of flow rate and gas density, we have to study them somewhat as a mechanism. Any mechanism operated at high speed and high load will wear quickly. If we reduce the speed to maintain

a high load or if we reduce the load and permit a high speed, we increase the life of the mechanism. The correlation of speed and load should be known in determining just how to rate any mechanism, such as a meter. In order to accomplish this fact for an industrial meter measuring gas at high pressure, we must provide some means to correlate load and speed. The speed in a meter we express as dial speed or actual cu.ft. of displacement at the pressure of measurement. The load on a meter we must eventually express as pressure loss across it, but above we discovered that the pressure loss depends upon two factors, first the dial speed, and second, the actual density of the gas. Since these factors are interwoven, the best way to determine the capacity of the meter is to plot a curve such as shown in fig. 1. On this curve abscissa represent the actual dial speed of the meter, and by ordinates at the left were present the pressure loss across the meter expressed in inches of water head. For any given meter, from our experimental work, we know that at a given dial speed with a 0.6 gravity gas will cause a pressure loss of a given amount. From this fact we can determine the pressure loss at any dial speed for that particular gas from the formula given above. In this way we are able to plot a series of curves starting approximately at the lower left-hand corner and moving to the right upward. These curves give for each line the pressure loss through the meter for a gas with a density corresponding to that line at the various rates of flow as given by the abscissa. Thus following out the line for any given density of gas we can at any given flow rate determine the pressure loss existing under those conditions.

Considerable study, experimental work, and observation will tell us about what to expect in life from a meter as the pressure loss and speed varies. This experience is formulated in the curve which we call the load limiting curve, starting at the upper left-hand corner and going down to the lower right-hand corner and crossing the density lines. It will be noticed from this curve if we examine the point where it crosses the 0.6 gravity line, this corresponds with 2 in. of pressure loss. This is due to the fact that all meters of this type are given a rating on 0.6 gravity gas at 2 in. of pressure loss. In using this curve it is only necessary to know the density of the gas being measured, and by following this density line up towards the right to point where it intercepts the load limiting line, and then by dropping straight down to the abscissa scale, the maximum permissible dial rate can be obtained. To determine the density it is only necessary to multiply the absolute pressure of measurement times the specific gravity of the gas and divide by the local atmospheric pressure expressed in absolute units.

In effect, this curve merely tells us that if we measure gas at higher pressures we must limit the maximum dial speed to which the meter can be operated. If we use gas at lower pressures—let us say, normal distribution pressures—we can use a meter up to the maximum dial speed for which it is actually rated. Please note we have used "dial speed" here to correspond to the actual cubic feet displacement of the meter independent of pressure. It is obvious when the gas at metered pressure is reduced to base conditions of pressure, it will represent a great many more cubic feet numerically than the dial speed does. Thus, in using diaphragm meters at higher than normal distribution pressures they may be used at pressure losses higher than 2 in. of water providing the dial speed is reduced accordingly. Just how far to go in this direction will depend somewhat upon experience. The curve shown in fig. 1 represents the experience of several years in using meters up to their maximum ability. The main point to note is that in meters designed for this type of service, accuracy is maintained by building all parts of extreme ruggedness. Meters of this type operating at, let us say, a pressure loss of 4 in. of water when this pressure loss is caused by density increase, will give the same degree of accuracy as domestic meters operating on pressure losses of less than $\frac{1}{2}$ in. of water.

When we come to metering industrial gas at normal distribution pressures with iron and steel meters, we must limit, because of the limitation on dial speed, the actual number of cubic feet measured to the amount measured corresponding to a 2 in. pressure loss for a 0.6 gravity gas. In other words, the 2 in. pressure loss which we permit at the full dial speed of the meter will not cause excessive distortion, and if other pressure conditions will permit these meters can be used on normal distribution pressures right up to their flow rate, which will correspond to a loss in pressure of 2 in. across the meter. Sometimes pressure conditions on the consumer's premises will not permit this total of 2 in. loss, but no matter what loss is permitted, the meter is rugged enough to operate very accurately on these losses. Since the same parts to control the diaphragm movement and valve movement are used on these meters when operating on low pressures as is used on high pressures, a very high degree of accuracy is attained, and the parts being rugged, the meters will operate for a long period of time in a satisfactory manner.

Features other than maintenance of accuracy also influence the meter installation. In industrial settings there is a fair possibility that external damage may be done to the meter by trucks, piled materials, &c. Also strains due to piping, unless properly resisted by the meter itself, may cause leaks and internal injury. Hence ruggedness, external and internal, should be pre-requisites of a good industrial meter.

Appearance, a factor which is too often neglected, should also come in for its share of attention. The meter and its setting is often the only contact between the customer and the gas company. A slipshod and unwieldy installation continually in front of the consumer's eyes may have an adverse effect. A neat appearing meter and piping layout will tend to create a better picture of scientific precision and accuracy. These features, added to accuracy, should be considered in selecting an industrial meter.

One fact which must be remembered in high-pressure measurement is that the meter measures only displacement, and that some means must be provided to permit a billing of gas at the base pressure. Gauges making necessary pressure volume records on charts which can be computed is a method most commonly used. Automatic registers which automatically correct the volume to equivalent cubic feet of gas at base pressure were brought out a few years ago and have been improved steadily, so that they offer a satisfactory and trouble-free method of arriving at the correct billing when gas is metered at high pressure.

In the whole field of industrial metering there is one subject on which there appears to be a great diversity of opinions; proving of industrial meters varies greatly between the companies. This one point should be well considered by any competent gas company management. Period of proving, type of proving equipment, expected accuracy, flows at which to prove and many other details should be determined and, if good industrial measurement is to be obtained, a rigid policy adopted and pursued.

In many locations the domestic meters are removed and returned to the meter shop for proving at stated periods. These periods are sometimes prescribed by statute, or by company practice. Industrial meters, not usually coming under regulatory bodies, are too often left to chance as to when they shall be proved. A survey indicates inspection periods ranging from one a month to an indefinitely long period, depending on complaints or whims. Note that this is just a visual inspection, not necessarily a testing operation. Actual periods of proving—*i.e.*, checking the meter for accuracy—also is extremely variable. It certainly should be standardized in any one company, and for each size and type of industrial meter an optimum period of proving should be maintained. For this purpose a record by meter number of the meter's history should be kept.

This matter of a proving period for industrial meters is a controversial one. Two different schools of thought emerge as soon as the subject is broached. One contends that the basis for proving period should be the number of cubic feet passed by the meter—*i.e.*, a mileage basis—while another, taking the cue from accepted domestic meter practice, tries to arrive at some time period on which to base proving. One would be foolhardy to judge between these two views; we might point out, however, that where "chemistry" is the deciding factor, the time basis is preferred. For instance, in certain manufactured gas properties condensates or gums may be the chief cause of meter inaccuracy, and the magnitude of the load might be relatively low. Here the deterioration may be progressing with the meter hardly operating. Obviously a time period of inspection and proving will be the best remedy against inaccurate measurement in this case. In places where natural gas, for instance, is distributed, deterioration from chemical causes is usually quite slow; in these places, however, loads are often heavy, and mechanical wear will usually be found to cause the inaccuracies. In this place a logical period would be based on the "mileage" plan. A careful analysis of meters in for repairs should furnish a basis for determining the type of proving period to use, and the amount of the period. It is conceivable that combination of mileage and time periods would best serve many locations.

The impossibility of discharging gas indoors, yet the desirability of proving meters at location, leads to the method of using the low-pressure flow prover at location and using air as a medium. To do this it is necessary to transport to the meter location an electric driven blower in addition to the flow prover. These are available working on 110 v. A.C. current, a $\frac{3}{4}$ h.p. motor delivering 8,000 cu.ft. per hour against a 10 in. head, thus giving the maximum flow rate for the largest diaphragm

meter. Convenient connexions, usually 2 in. stubs, should be provided in the inlet piping of the meter installation for the blower, in the outlet piping for the low-pressure flow prover; in this way a test run can be made at location very readily. This method is relatively new, but it is the writer's opinion that it offers, with proper operation, a satisfactory and cheap method of maintaining industrial meters at their highest accuracy with the least expense.

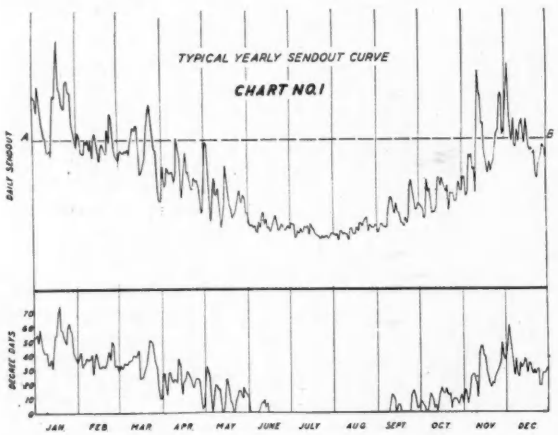
Another method, that of the critical flow prover, discharges gas into the atmosphere, and for that reason can be used only on meters which are located outside or where the gas can be discharged to the outside. It is necessary to have a gas pressure more than 13 lb. per sq. in. gauge in order to operate the critical flow prover. The principle of operation is based on the fact that the velocity of gas through an orifice cannot exceed a certain limiting value (the velocity of sound in that gas), once a certain pressure difference across the orifice is reached. It is somewhat simpler in operation than the low pressure flow prover in that the upstream pressure does not have to be observed or corrected for. This method is in fairly general use in field, town border, and other stations, where gas pressure is available and gas can be discharged to the atmosphere.

FLAMDICATOR*

By M. G. MARKLE, *Public Service Company of Northern Illinois*

THIS Paper covers some developments in equipment for determining the comparative combustion characteristics of various fuel gases, and the application of this equipment to gas systems distributing mixed gases.

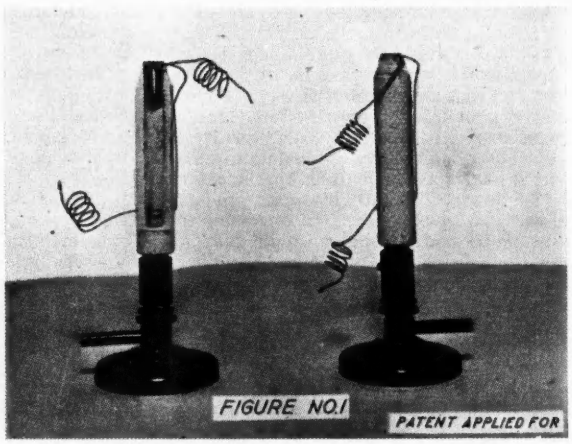
The daily sendout on a system having a fair percentage of space heat load varies during the year somewhat as shown on chart 1, the demand on a summer day being a relatively small proportion of that required on a cold winter day. The area on this chart below the broken line A–B represents the portion of the demand that may be supplied by a base load gas. Very often this supply is limited to a definite amount for any one day, requiring, on peak days, the addition of some type of manufactured gas.



The combustion characteristics of a peak load gas are normally different from those of a base load gas. Since only base load gas is distributed during the greater portion of the year, appliances on the mains are necessarily adjusted to that gas, its particular combustion characteristics setting the standard of adjustment. Therefore, when a peak load gas is mixed with the base load gas it results in a different performance, varying with the increased percentage of peak load gas in the sendout mixture. Anyone involved in operating conditions of this nature soon realizes that the customary practice of judging combustion characteristics of a gas mixture from the heating value and specific gravity alone is misleading. It soon becomes evident to him that combustion characteristics are dependent not only on the B.Th.U. and gravity, but on the chemical composition of the mixture.

To cite an example of all this, let me take the case of a system of approximately 50,000 customers who are somewhat above the average as gas users, exemplified by the fact that the territory is at the present time about 11% saturated with gas space heat. Normally these customers are served with an 800 B.Th.U. 0.55 gravity mixed natural base load gas. During peak periods this base load gas is augmented with an 800 B.Th.U. carburetted water gas. Test observations taken on a set of representative burners indicated a difference in the combustion characteristics of the peak load and base load gases, and brought out the desirability of finding some device that would indicate to us at the station the character of appliance performance in the field so that we could supply some means of regulating the sendout mixtures and maintain that performance within the satisfactory range. Simply stated we needed an instrument that would automatically indicate the changes in combustion characteristics of our sendout gas mixtures.

Investigation soon proved that something more than a recording calorimeter and a specific gravity recorder was necessary to give us the indication we needed. After much experimentation with numerous ideas we conceived the theory that possibly burner temperatures were somehow related to the combustion characteristics of different mixtures of our peak and base load gases. Following this clue we took the temperatures at the tip of a bunsen burner with various mixtures of these two gases applied to it. The results proved our theory to be correct, in



that these temperatures plotted against the mixtures resulted in a smooth, well-defined curve.

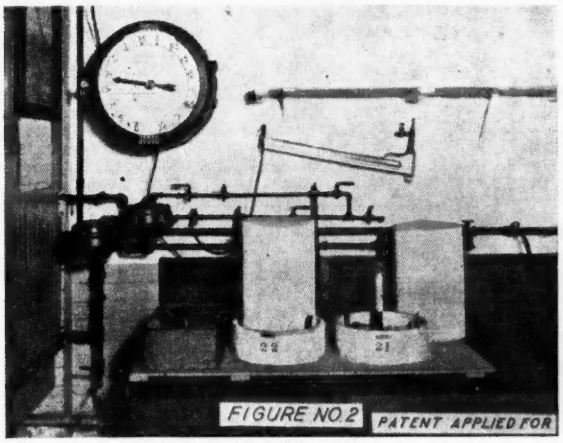
From the discovery of this fundamental fact the "Flamdicator" was developed (fig. 1). It consists of a 10.2 millimeter bunsen burner with an air adjustment that can be locked in place, and a stainless steel tip separated and insulated from the base of the burner by an asbestos tube. A thermocouple is attached to the tip just below the edge exposed to the flame, and the cold junction thermocouple is placed directly within the gas air stream, connected such that the E.M.F. of one thermocouple is opposed to the other. The incorporation of an insulating tube in the construction of the burner is to retard the loss of heat from the tip and thereby attain the range of readings wanted. Also, connecting the cold junction as we do, we record, not the actual temperature at the tip, but the degree of heat absorbed by the tip due only to the burning of the gas air mixture.

In actual operation the "Flamdicator" is set up as shown in fig. 2. The burner is fixed within a transite jar constructed so as to allow for free passage of primary and secondary air through a false bottom. The supply of gas is regulated to 2 in. water pressure by a sensitive inches to inches regulator with an incline gauge connected to its outlet as a ready means of checking the operating pressure. We used a Leeds-Northrup Micromax as an indicator-recorder principally because of the large indicating dial available on this type of instrument. To broaden the scale and make the reading smore discernible we had it equipped with an eight microvolt suppressed zero scale.

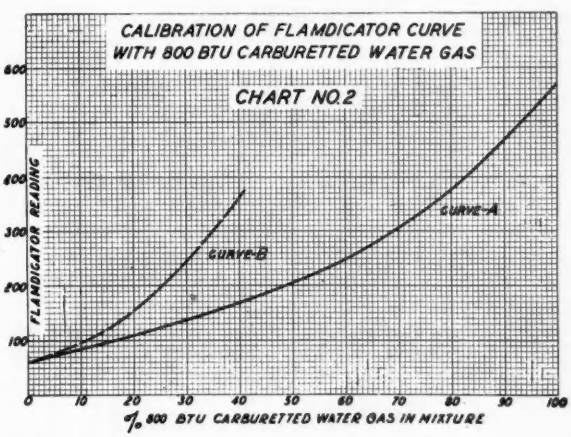
As I have indicated previously, our primary interest was in mixtures of carburetted water gas with base load gas. The

* From a paper to the American Gas Association (Technical Section).

"Flamdicator" was therefore calibrated with various mixtures of these gases, and a curve was drawn (chart 2) with "Flamdicator" readings plotted against percentages of carburetted gas in the mixture. Those familiar with the production of carburetted water gas will realize that this is not a true calibration of the instrument because of the variations in the quality of a gas produced from day to day. However, the real purpose of this calibration, if we may call it such, was to see that the instrument behaved properly over the whole range, and also to furnish us with a rough idea of the amount of peak load gas in the mixtures going to the street.



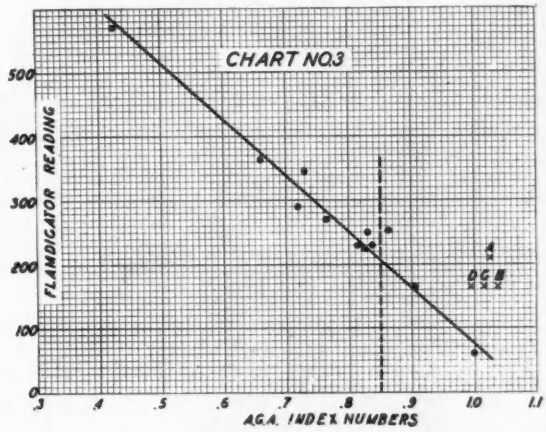
While I am referring to this curve I would like to point out the significance of the dotted curve B. We found that if mixtures were applied to this burner that would cause incomplete combustion the readings increased again along curve B as the flame became softer and finally developed a yellow tip. We have not made a complete calibration of this curve since we were concerned more with a peak load gas that tended to cause hard, sharp flames.



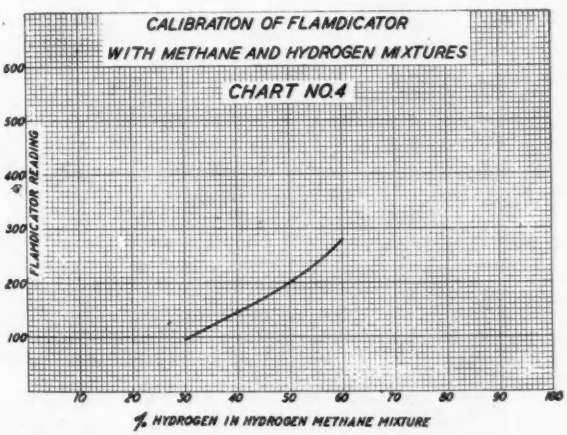
To apply this instrument to our particular operating problem it was necessary for us to correlate "Flamdicator" readings with actual burner performance. Peak load gas was added to the mixture in slow steps until faulty burner performance indicated a stop point had been reached. This test established the fact that any sendout mixture that maintained a "Flamdicator" reading of 200 or less was satisfactory for customer consumption. We have had occasions to check the conclusions reached from this test by actual peak load operations and have found them to be correct.

Some investigations were recently made by us toward finding a substitute gas that would allow greater peak load production. The "Flamdicator" was used as the index of interchangeability of the various gases produced. During the investigation we produced a gas of the same B.Th.U. and gravity as our base load gas, but of different chemical composition. Both the "Flamdicator" and visual observation indicated that this gas had different combustion characteristics than that of our base load gas.

I have calculated the A.G.A. index numbers of various gases that have been applied to the "Flamdicator" in order to see what relation they might have to the readings taken on the instrument (chart 3). The evidence would be more conclusive if I had had more analysed samples available; however, the points as plotted indicate quite definitely that there is a straight line relation between the two. You will also note that the recommended lower limit of 0.850 for the indexed number coincides surprisingly well with the maximum allowable reading on the "Flamdicator." I would like to point out that points A, B, C, and D represent gases that resulted in a high burner input. These



particular samples were checked by visual inspection on a set of representative burners and were found to correspond in operating characteristics to that indicated by the "Flamdicator"; however, the index number calculated higher than was expected. Possibly this was due to the high input value, but I believe it was more likely due to the lack of a complete analysis of the illuminants, thereby affecting the calculated results of the A.G.A. formulae.



It will readily be seen that some means of easily calibrating new burners and checking old burners had to be devised. For this we used definite mixtures of methane and hydrogen. We first applied these mixtures to a burner of known performance and obtained readings corresponding to each mixture. Using these as a standard, which can be recorded in the form of a curve (chart 4), we calibrate and adjust any new or old burner to the range of readings that we particularly desire.

Flamdicators that are in continuous use are subject to dust and lint in the air and gas inlets, and possibly to other changes of a permanent nature, such as corroded thermocouple contacts. If an old burner does not return to its original range of performance after it has been thoroughly cleaned, it is assumed that such a change has taken place. To correct this possibility each "Flamdicator" is equipped with an adjustment by which we raise or lower the whole range of readings to within the limits desired. It is evident that by the same means we can accurately match all burners, old or new, so that all of our "Flamdicators" will indicate the same reading for any one gas mixture.

While this paper was being prepared a new burner was in the

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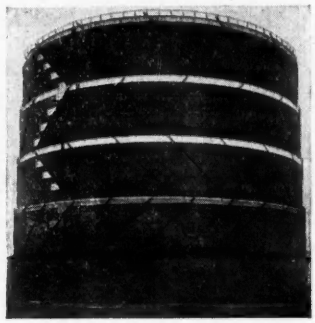
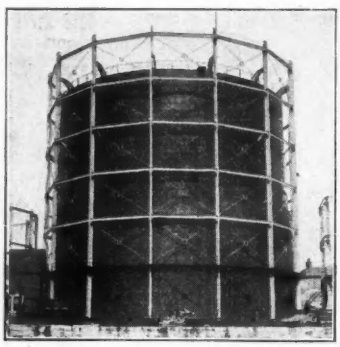


PURIFIERS
CONDENSERS
STEEL BUILDINGS
STEEL TANKS



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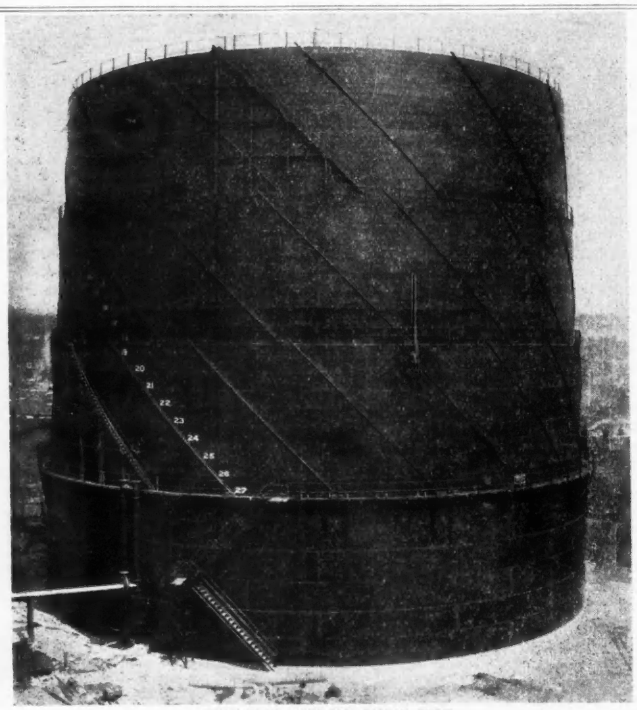

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final stages of development and will soon replace the one that I have described in this paper. The principle is the same, but we have simplified the construction. We have accomplished the same results that we did with the insulating sleeve by using a metal of low heat conductivity for the burner tube and removing some of the metal near the tip. We still have some work to do towards simplifying the method and equipment used for checking purposes, and we also hope to find the answer to the whys and wherefores of this burner. So far we do not have a complete answer as to why it should react to flame conditions as it does. We have, however, observed at times certain unusual reactions that lead us to believe that possibly now we have the clues necessary to direct an investigation that will eventually solve this problem.

PATENTS

Heating Systems for Coke Ovens

Among recent patents is one (No. 534,641; application date, Sept. 11, 1939) taken out by the Woodall-Duckham (1920) Ltd., A. Taylor, and A. N. Clark. It relates to improvements in heating systems for coke-ovens. It is applicable to ovens heated by rich gas (*e.g.*, coal gas) only, and also to the so-called "combination" ovens which are adaptable for heating either by rich gas or by a lean gas such as blast-furnace gas.

When rich gas and air are supplied together to the base of a heating-flue of a coke-oven, the rapid combustion of the rich gas tends to liberate excessive heat in the lower part of the flue, with the result that there is a tendency for the lower part of the flue (and consequently the adjacent part of the charge in the oven) to be overheated, while the flame does not extend fully to the top of the flue, which is correspondingly underheated.

Fig. 1.

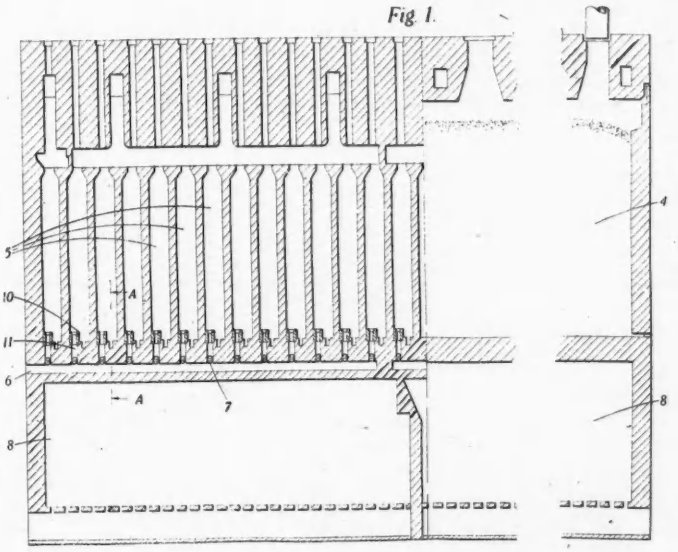


Fig. 3.

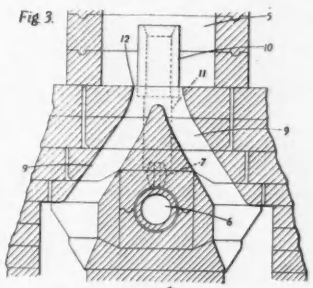
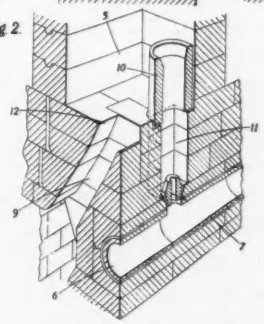


Fig. 2.



Various proposals have previously been made for obtaining uniform heating with rich gas firing; for example, a portion of the products of combustion have been returned to the base of the flue to dilute the combustion gases and so lengthen the flame. It has also been proposed to begin the combustion at alternate low and high levels in successive flues, so that on the average the heating is uniform over the full height of the oven. Moreover, it has already been suggested, in connexion with coke-oven heating systems, to supply rich gas for combustion into the vertical up-burning heating flues at a level which is the same in each flue and is at a substantial distance above the bases of the flues, whilst the combustion air is supplied through ports in the bases of the flues. It has also been proposed to arrange regulating nozzles or orifice members for the rich gas supplied to a coke-oven heating flue at the lower ends of wells which extend below the level of the bases of the heating-flues.

The object of the invention is to provide a heating system for coke-ovens in which, when the heating is effected by rich gas, the heat is uniformly distributed over the entire height of the oven. A coke oven of the kind in which rich gas for combustion is led into each heating flue at the same level and at a substantial distance above the base of the flue while air for combustion is led into each heating flue through an opening in the base of the flue, is characterized by the feature that both the rich gas and the air for combustion are led into the flue through passages adapted to give vertical non-turbulent streams of gas and air respectively, and the gas and the air enter the flue at approximately equal velocities. A regulating orifice for the rich gas is situated at the bottom of a well extending below the base of the flue and a vertical tubular member is situated above the top of the well.

The application of the invention is illustrated in the accompanying drawings, in which fig. 1 shows a vertical longitudinal section through a coke-oven battery, the right-hand portion being a section through the oven, and the left-hand portion a section through the heating-flue system. Fig. 2 is an enlarged sectionalized perspective view of the base of a heating flue embodying the invention, and fig. 3 is an enlarged section through the base of a heating-flue on the line A—A of fig. 1.

Referring to the diagrams, 4 is the coke-oven in which coal is coked by the heat generated by the combustion of fuel gas and air in the heating-flues 5. When the oven is heated by rich gas (*e.g.*, coal gas) the rich gas may be supplied to the lower end of the flues 5 through the gas duct 6 and the regulating nozzles 7, which latter are situated at the bottom of a well 11 extending below the base of the flue 5, while combustion air, preheated in the regenerators 8, is supplied through the passages 9. When the oven is of the kind known as "underjet-fired oven" the rich gas is supplied in controlled amounts to the flues 5 from distributing headers situated in the oven basement below the regenerators, through vertical ducts in the vertical division walls between the regenerators, the air supply to the flues being as before. If the ovens are arranged as "combination ovens" then, when operating on lean gas (*e.g.*, blast-furnace gas) the lean gas is pre-heated in one set of regenerators and the air is pre-heated in another set of regenerators, and the streams of pre-heated gas and air are fed together to the flues through the passages 9.

The rich gas (whether supplied through the duct 6 or by an underjet system) is led into the lower end of each flue 5 through a vertical refractory tube 10 arranged as a continuation of the well 11. The rich gas outlet from the tube 10 is at the same fixed level in each flue 5 of the heating wall, at a level of, say, 9 in. to 15 in. above the base of the flues 5 in the case of a flue 9 ft. high. The gas pressure and the dimensions of the tube 10 are so correlated that the correct amount of gas enters the flue in a vertical jet which is, as far as is practicable, non-turbulent.

The combustion air enters the base of the flue through the port 12 formed at the junction of the passages 9. The port 12 has smooth sides adapted to give, as far as is practicable, a streamline (non-turbulent) form to the vertical stream of air entering the flue.

It is arranged that the velocities of the air stream from the port 12 and of the gas stream from the tube 10 are approximately equal. Hence the gas and air ascend the flue in parallel streams at approximately equal velocities, commingling only slowly owing to the absence of excessive turbulence in the streams, and thus providing a gradual combustion extending over the greater part of the height of the flue, the bottom part of the flue below the gas tube 10 being effectively heated by radiation from the flame. In this manner an average uniform heating is effected over the full height of the oven 4.

An advantage of introducing the air stream through the port 12 below the opening of the gas tube 10 is that eddies created at the mouth of the port die away or diminish in the interval before the gas stream is encountered.

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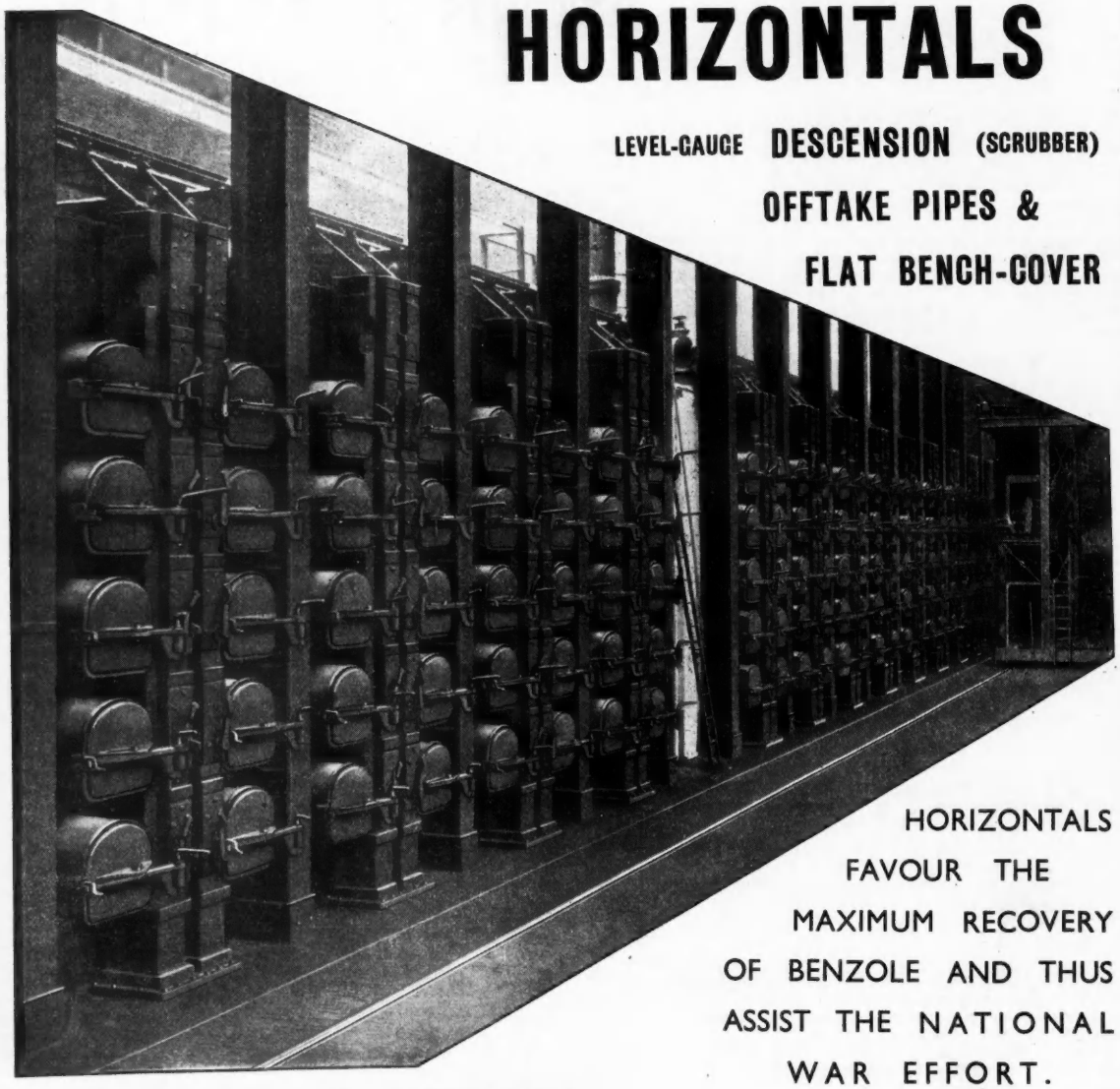

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Gas Products Prices

The London Market

June 2.

There is no change to report in the prices of Tar Products in the London Market. Values remain to-day as indicated below :

Pitch is nominal; creosote 4¾d. to 5d.; refined tar 3¾d. to 4d.; pure toluene under the Ministry of Supply Toluene No. 2 Order is 2s. 5d.; pure benzole is 1s. 10d.; 95/160 solvent naphtha 2s. 5d. to 2s. 8d.; and 90/160 pyridine 13s. 6d.; all per gallon naked; refined crystal naphthalene £23 per ton in bags; all prices are *ex* Makers' works.

The Provinces

June 2.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 1s. 10d. (controlled by the Control of Toluene No. 2 Order, July 5, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North, 10d. to 11d. Solvent naphtha, naked, North, 1s. 9d. to 1s. 10d. Heavy naphtha North, 1s. 6d. to 1s. 7½d. Creosote, *ex* works, in bulk, North, liquid and salty, 4½d. to 4¾d.; Scotland, 4¼d. to 4¾d.; low gravity, 4½d. to 4¾d. Fuel Grade, 4d. to 4¼d. Carbolic acid, 60's, 3s. 7½d. to 3s. 9d. Naphthalene, £12 to £15. Salts, 70s. to 80s., bags included. Anthracene, "A" quality, 4½d. to 4¾d. per minimum 40% purely nominal. Heavy oil: Unfiltered anthracene oil (min. gr. 1,080), 5¼d. to 5½d.; filtered heavy oil (min. gr. 1,080), 5¾d. to 6d.; heavy anthracene oil gr. less than 1,080, 6d. to 6¼d.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note in our issue of Sept. 4, 1940, p. 404.

Tar Products in Scotland

GLASGOW, May 31

Production and demand are well balanced and prices continue steady.

Refined tar is receiving more attention with home price unchanged at 4½d. to 4¾d. per gallon and export value maintained at 3¼d. to 3½d. per gallon, both f.o.r. naked.

Creosote oil is still in good call at the following prices: Specification oil, 5d. to 5¼d. per gallon; low gravity, 6d. to 6½d. per gallon; neutral oil, 5¾d. to 6d. per gallon; all *ex* Works in bulk.

Cresylic acid: Demand for this continue strong but, with prompt supplies scarce, the following prices can only be taken as being approximate: Pale, 99/100%, 2s. 11d. to 3s. 1d. per gallon; Pale, 97/99%, 2s. 7d. to 2s. 9d. per gallon; Dark, 97/99%, 2s. 4d. to 2s. 6d. per gallon; all *ex* Works in buyers' packages.

Crude naphtha is maintained at round 6½d. to 7½d. per gallon *ex* Works in bulk, according to quality.

Solvent naphtha: 90/160 grade is 1s. 8½d. to 1s. 9d. per gallon and 90/190 Heavy Naphtha is 1s. 4½d. to 1s. 5½d. per gallon.

Pyridines are quiet at about 14s. per gallon for 90/160 grade and 16s. per gallon for 90/140 grade.

Mr. ARTHUR W. HUYTON, well known as Gas Fittings Representative, has joined the Selling Staff of Messrs. Evered & Company, Ltd., Gas Engineers, Surrey Works, Smethwick. This is not just a wartime measure, as the appointment is of a permanent character, and his many friends will wish him a continuance of that success that has accompanied his past efforts in the Gas Industry.

London and Southern Juniors

The Annual General Meeting of the London and Southern District Junior Gas Association was held on Friday, May 23, at the Westminster Technical Institute. The President, Mr. F. O. Hawes, was in the chair.

The following Officers and Council were elected for the ensuing Session:

President: F. O. Hawes, Tottenham and District Gas Company.

Sen. Vice-President: G. Dougill, Gas Light and Coke Company.

Jnr. Vice-President: H. Moys, Commercial Gas Company.

Hon. Treasurer: S. J. Gibbons, Gas Light and Coke Company.

Hon. Secretary: C. A. Deas, Tottenham and District Gas Company.

Hon. Asst. Secretary: J. E. Gray, Gas Light and Coke Company.

Hon. Auditor: G. Wilson Smith, Gas Light and Coke Company.

Council: L. W. Andrews, Gas Light and Coke Company ; B. W. Dawkins, Gas Light and Coke Company ; J. E. Gray, Gas Light and Coke Company; F. H. Higton, East Surrey Gas Company; R. W. Latham, Croydon Gas Company; G. H. Kenyon, Lea Bridge Gas Company; T. G. Noble, Gas Light and Coke Company; G. H. Rodgers, Gas Light and Coke Company.

Ex-officio: W. A. Howie, Southern Association of Gas Engineers; F. Blackburn, Southern Association of Gas Engineers.

Representatives to serve on the District Education Committee: T. H. Prater (Hon. Sec.), Isle of Thanet Gas Company; F. O. Hawes, Tottenham and District Gas Company; G. Dougill, Gas Light and Coke Company; C. A. Deas, Tottenham and District Gas Company.

A discussion took place on the desirability of resuming activities of the Association during the lighter evenings of the year. The meeting finally agreed to recommend to the Council that two or three meetings should be arranged.

It was decided that the subscription for the ensuing Session should be 5s., except in the case of those members on Active Service, who would remain members for the duration of the war or until such time as they returned to normal life, but would not be called upon to pay a subscription.

A hearty vote of thanks was accorded to Dr. J. N. Long for his kindness in allowing the use of the Westminster Technical Institute for meetings of the Association during the past year.

At the conclusion of the business meeting Mr. T. S. Ricketts, of the Hertford Works of the Tottenham and District Gas Company, read his article entitled "Gas and Steam Loads on Small Works," which was published in the "JOURNAL" of March 19.

Several speakers took part in the discussion which followed, and on the proposition of Mr. F. C. Smith a hearty vote of thanks was accorded to the Author for his Paper.

These are
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metal-to-metal
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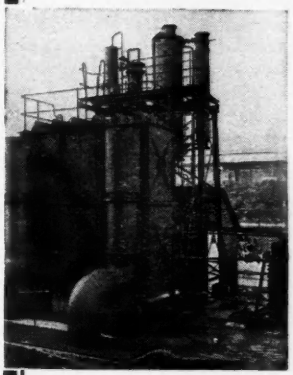
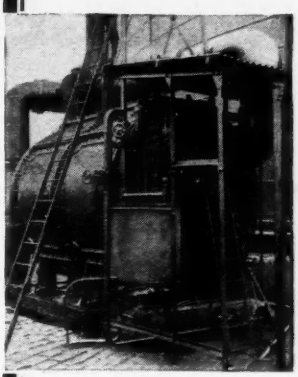


"Permac" Joints in a Gas Works.



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GAS STOCKS AND SHARES

Business was a little better at the opening last week but tailed off towards the close, presumably owing to the approach of the Whitsun holiday. British Funds continued firm and several closed fractionally higher—2½% Consols being ½ better at 79. Home rails remained dull and quiet. There were occasional bursts of activity among industrials, iron and steel shares being strong features, and although this section closed on the dull side the general undertone was firm. Oil shares also had their good points and some improvements were recorded among rubber shares. The Kaffir market on the whole was quiet and featureless.

There were more transactions recorded in the Gas Market than during the previous week, but it will be seen in the lists below that very few quotations were affected either way.

An important item of news last week was the announcement of the Government's outline of a scheme of war damage legislation for public utility undertakings. It is proposed that each group shall pay half the aggregate estimated war damage sustained by that group, and it has been left to the various industries, water, gas, electricity, &c., to devise a scheme, to be approved by the Treasury, for the payment of the aggregate contributions by the members of each group. Contributions will be payable in four annual instalments commencing on July 1, 1942. Since it has never been the Government's intention to pay compensation for loss of business it is not anticipated that the scheme can have any marked effect on stock prices.

Quotations on the London and Provincial Stock Exchanges

OFFICIAL LIST

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations May 29.	Rise or Fall on week.
1,767,439	March 10	7	6	Alliance & Dublin Ord. ...	85—90	...
374,000	Dec. 30	4	4	Do. 4 p.c. Deb. ...	90—95	...
957,608	May 5	5	5	Assed. Gas & Water U'd'ts Ord.	11/6—13/6	...
500,000	,,	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	14/—16/-	...
535,545	,,	4	4	Do. 4 p.c. Red. Cum. Pref.	14/—16/-	...
336,646	,,	4	4	Do. 4 p.c. Irred. Cum. Pref.	9/6—11/6	...
561,370	Feb. 17	7	7	Barnet Ord. 7 p.c.	95—100	...
300,000	Oct. 14	1/9⅜	1/4⅜	Bombay, Ltd.	19/6—21/6	...
690,407	Feb. 24	7	7	Bournemouth 7 p.c. max. ...	110—120	...
362,025	Dec. 16	4	4	Do. 4 p.c. Deb. ...	88—93	...
659,955	March 3	4⅜	2½	Brighton, &c., 5 p.c. Con. ...	60—65	...
855,000	March 10	6	6	Brit. Gas Light Ord.	60—70	—5
545,000	Dec. 16	5½	5½	Do. 5½ p.c. 'B' Cum. Pref	105—115	...
120,000	,,	4	4	Do. 4 p.c. Red. Deb.	75—80	...
10,000	Nov. 6 '33	6	4	Cape Town, Ltd., 4½ p.c. Cu. Pf.	½—¾	...
626,860	Feb. 3	6	6	Cardiff Con. Ord.	87—92	...
24,500	May 5	7	7	Colombo 7 p.c. Pref.	18/6—19/6	...
764,169	March 24	-/11.48	-/11.48	Colonial Gas Assn. Ltd. Ord. ...	13/6—15/6	...
400,000	,,	1/3.30	1/3.30	Do. 8 p.c. Pref. ...	18/6—20/6	...
1,748,935	July 22 '40	2	3	Commercial Ord.	25—30	...
620,000	Dec. 19	3	3	Do. 3 p.c. Deb.	54—59	...
286,344	Feb. 7	5	5	Do. 5 p.c. Deb.	87—92	...
807,560	Feb. 24	6	6	Croydon sliding scale	80—85	...
644,590	,,	5	5	Do. max. div.	78—83	...
620,385	Dec. 30	5	5	Do. 5 p.c. Perp. Deb. ...	95—100	...
179,500	Feb. 10	5	5	East Surrey 'B,' 5 p.c.	60—70	...
176,461	Dec. 16	5	5	Do. 5 p.c. Deb. (Irred.)...	87—92	...
250,000	Nov. 11	4	6	Gas Consolidation Ord. 'B' ...	13/6—14/6	...
250,000	May 12	4	4	Do. 4 p.c. Red. Cum. Pref.	14/6—16/6	...
19,122,910	July 29 '40	3⅜	4½	Gas Light & Coke Ord. ...	9/6—10/6a	...
2,600,000	,,	3½	3½	Do. 3½ p.c. max.	30—40	...
4,477,106	,,	4	4	Do. 4 p.c. Con. Pref. ...	49—54	...
2,993,000	July 8 '40	3½	3½	Do. 3½ p.c. Red. Pref. ...	60—70	...
8,602,497	Dec. 2	3	3	Do. 3 p.c. Con. Deb. ...	67—72	...
3,642,770	,,	5	5	Do. 5 p.c. Red. Deb. ...	103—108	...
3,500,000	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	100—105	...
700,000	March 10	3½	3½	Do. 3½ Red. Deb. ...	80—85	...
5,600,000	May 13 '40	4	8	Imperial Continental Cap. ...	40—45	...
43,820	Jan. 27	3½	3½	Do. 3½ p.c. Red. Deb. ...	75—80	...
231,978	Feb. 24	5	5	M.S. Utility 'C' Cons.	66—71	...
918,657	,,	4	4	4 p.c. Cons. Pref.	73—78	...
675,000	May 5	†4	†4	Montevideo, Ltd.	53—58	...
300,000	April 28	9	7	Oriental, Ltd.	119—124	...
368,537	Dec. 9	8	6½	Plymouth & Stonehouse 5 p.c.	88—98	...
621,667	Feb. 3	7½	7½	Portsmouth & Gosport Cons.	90—95	...
648,999	May 12	1/1	1/1½	Severn Val. Gas Cor. Ld. Ord.	13/6—15/6	+—/6
597,972	March 10	-/10⅝	-/10⅝	Do. 4½ p.c. Cum. Pref. ...	15/6—17/6	...
2,528,714	May 19	7½	1/—	South East'n Gas Cn. Ld. Ord.	8/—10/-	+—/3
1,000,000	March 3	-/10⅝	-/10⅝	Do. 4½ p.c. Red. Cum. Pref.	13/—15/-	...
1,068,869	,,	4	4	Do. 4 p.c. Irred. Cum. Pref.	10/—12/-	...
6,709,895	Aug. 5 '40	4	4	South Met. Ord.	30—35	...
1,135,812	,,	6	6	Do. 6 p.c. Irred. Pref. ...	75—80	...
850,000	,,	4	4	Do. 4 p.c. Irred. Pref. ...	55—65	...
1,895,445	Dec. 30	3	3	Do. 3 p.c. Perp. Deb. ...	63—68	...
1,000,000	Jan. 15	5	5	Do. 5 p.c. Red. Deb. ...	98—103	...
1,543,795	Feb. 24	4	2	South Suburban Ord. 5 p.c. ...	53—58	...
512,825	,,	5	5	Do. 5 p.c. Perp. Pref. ...	75—80	...
500,000	,,	4	4	Do. 4 p.c. Perp. Pref. ...	60—65	...
250,000	,,	3⅜	3⅜	Do. 3⅜ p.c. Red. Pref. ...	78—83	...
888,587	Dec. 16	5	5	Do. 5 p.c. Perp. Deb. ...	95—100	...
750,541	Feb. 10	5	2	Southampton Ord.	50—60	...
350,000	Feb. 10	5½	5½	Swansea 5½ p.c. Red. Pref. ...	88—93	...
1,076,495	Feb. 24	5	5	Tottenham & District Ord. ...	70—75	...
338,555	,,	5	5	Do. 5 p.c. Pref.	78—83	...
453,380	Dec. 9	4	4	Do. 4 p.c. Perp. Deb. ...	78—83	...
1,247,505	May 20 '40	4	6	U. Kingdom Gas Cor. Ord. ...	12/—14/-	...
1,085,952	May 19	4½	4½	Do. 4½ p.c. 1st Cum. Pref.	13/6—15/6	...
772,709	,,	4	4	Do. 4 p.c. 1st Red. Cum.Pref.	13/—15/-	...
745,263	Dec. 16	4½	4½	Do. 4½ p.c. 2nd Non.Cum. Pf.	10/—12/-	...
1,200,000	March 17	3½	3½	Do. 3½ p.c. Red. Deb. ...	84—89	...
380,606	April 15	7	6½	Uxbridge, &c., 5 p.c.	80—90	...
1,371,138	April 7	4	4	Wandsworth Consolidated ...	58—63	...
2,525,768	,,	4	4	Do. 4 p.c. Pref.	61—66	...
1,343,964	Dec. 16	5	5	Do. 5 p.c. Deb.	95—100	...
383,745	,,	4	4	Do. 4 p.c. Deb.	75—80	...
558,342	Feb. 24	5	5	Watford & St. Albans Ord. ...	84—89	...
300,000	Dec. 9	3½	3½	Do. 3½ p.c. Red. Deb. ...	84—89	...

SUPPLEMENTARY LIST

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations May 29.	Rise or Fall on week
351,685	Dec. 16	5	5	Brighton, &c., 5 p.c. Perp. Deb.	88—93	...
28,700	,, 17	5½	5½	Do. 5½ p.c. Red. Deb. 1942 ...	95—100	...
415,250	,, 23	4	4	Bristol Gas Co., 4 p.c. New Deb.	88—93	...
140,205	Feb. 3	7	7	Cambridge, &c., 7 p.c. Cons. 'B'	100—110	...
295,932	March 3	5	5	Cheltenham, 5 p.c. Cons.Ord....	85—90	...
42,500	Dec. 16	4	4	Do. 4 p.c. Perp. Deb....	75—80	...
150,000	Feb. 24	4	4	Croydon Gas, 4 p.c. Pref. (Irr.)	68—73	...
130,000	Dec. 30	4	4	Do. 4 p.c. Deb. ...	75—80	...
146,700	Feb. 10	5½	5½	East Surrey, 5½ p.c. Pref. 'A' ...	80—90	...
53,220	,, 10	6	6	Do. 6 p.c. Cum. Pref. ...	90—100	...
...	Aug. 19	6	4	Eastbourne 'B' 3½ p.c....	30—50	...
239,135	Nov. 11	5	5	Gas Consolidation 'A' Ord. (£1)	11/6—13/6	...
156,600	Feb. 24	5	5	Hampton C'ts, 5 p.c. Cons. Ord.	67—72	...
18,000	Dec. 2	7	3½	Malta & Med'n., 7 p.c. 1st Pref.	50—60	...
10,845	,, 2	7½	3½	Do. 7½ p.c. 2nd Pref.	50—60	...
50,000	Feb. 24	£5 19 6	£5 4 6	Mid. South. Util., 'A' Cons. 5 p.c.	60—70	...
65,000	April 21	5	5	North Middlesex, 5 p.c. Pref. ...	75—80	...
70,000	March 10	5	5	Plymouth & Stone., 5 p.c. Deb.	83—88	...
76,501	Dec. 30	4	4	Reading, 4 p.c. Perp. Deb. ...	70—75	...
74,777	March 31	4	4	Romford, 4 p.c. Debs. (Reg.) ...	77—82	...
21,000	Dec. 16	5	5	Slough, 5 p.c. Perp. Deb. ...	87—92	...
211,740	,, 30	5	5	Southampton, 5 p.c. Red. Deb.	97—102	...
363,575	Dec. 30	5	5	Tottenham, 5 p.c. Reg. Red. Mt.	94—99	...
202,019	April 15	6½	6½	Tunbridge Wells, 4 p.c. Scale ...	65—70	...
135,257	Dec. 16	5	5	Uxbridge &c., 5 p.c. Perp. Deb.	95—100	...

PROVINCIAL EXCHANGES

					Quotations May 23.	
804,948	March 10	5	5	Bath Cons.	94—98	...
122,577	March 10	7	6	Blyth 5 p.c. Ord.	100—105	...
1,667,250	Feb. 24	5	5	Bristol, 5 p.c. max.	86—88	+1
120,420	Dec. 16	4	4	Do. 1st 4 p.c. Deb. ...	92½—94½	...
415,250	,,	4	4	Do. 2nd 4 p.c. Deb. ...	91—94	...
328,790	,,	5	5	Do. 5 p.c. Deb.	107—110	...
157,150	Feb. 3	5	6½	Chester 5 p.c. Ord.	98—101	...
92,500	Dec. 16	4	4	Do. 4 p.c. Pref.	79—81	...
36,430	,,	3½	3½	Do. 3½ p.c. Deb.	79—84	...
41,890	,,	4	4	Do. 4 p.c. Red. Deb. ...	93—97	...
542,270	Feb. 10	6	9	Derby Cons.	98—103	...
55,000	Dec. 16	4	4	Do. 4 p.c. Deb.	75—80	...
10,000	March 3	10	10	Great Grimsby 'A' Ord. ...	155—165	...
6,500	,,	10	10	Do. 'B' Ord. ...	155—165	...
79,000	,,	10	10	Do. 'C' Ord. ...	145—155	...
732,000	Feb. 24	4	4	Hartlepool G. & W. Cn. & New	61—63	...
2,167,410	Feb. 17	6	6	Liverpool 5 p.c. Ord.	89—92	— 1½
245,500	Dec. 16	5	5	Do. 5 p.c. Red. Pref. ...	97½—100½	...
306,083	Jan. 15	4	4	Do. 4 p.c. Deb.	98—100	...
20,000	Dec. 23	5	5	Long Eaton 5 p.c. Pref. ...	9—11	...
80,000	,,	5	5	Do. 5 p.c. Deb.... ...	87—92	...
2,430,267	Feb. 10	5	5½	Newcastle and Gateshead Con.	17/—18/—a	...
682,856	,,	4	4	Do. 4 p.c. Pref.	81—83	+1
776,706	Dec. 23	3½	3½	Do. 3½ p.c. Deb.... ...	85—87	...
277,285	Oct. 21	5	5	* Do. 5 p.c. Deb. '43 ...	97—102	...
274,000	March 17	5	5	Newport (Mon.) Ord.	86—89	...
13,200	Sept. 16	8⅜	7	Pontyp'l Gas & W. 10 p.c. 'A'	11½—12½	...
13,600	,,	6	5	Do. 7 p.c. 'B'	9½—10½	...
40,000	,,	5	6	Do. 7 p.c. 'C'	9½—10½	...
106,280	Feb. 3	10	10	Preston 'A' 10 p.c.	157—167	...
188,219	,,	7	7	Do. 'B' 7 p.c.	113—123	...
1,806,339	Feb. 24	6½	6½	Sheffield Cons.	109—111	...
95,000	Jan. 6	4	4	Do. 4 p.c. Deb.	96—98	...
332,351	Feb. 3	6	6	Sunderland 6 p.c. max. ...	107—110	...
192,150	Feb. 12	5	5	Weston-super-Mare Cons. ...	79—84	...
64,338	Dec. 30	4	4	Do. 4 p.c. Deb.	80—85	...
33,340	,,	7½	7½	Do. 7½ p.c. Deb.	135—140	...

a.—The quotation is per £1 of Stock. * Ex. div. † Price free of income-tax.

En passant

To wilful men
The injuries that they themselves procure
Must be their schoolmasters.

Shakespeare (King Lear)

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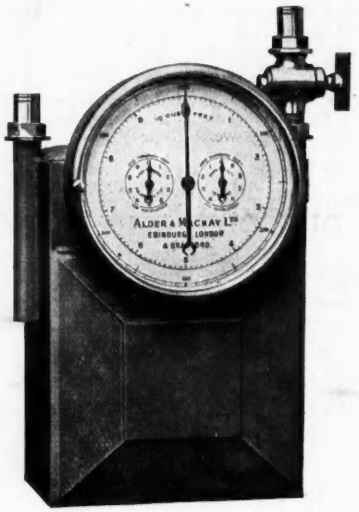

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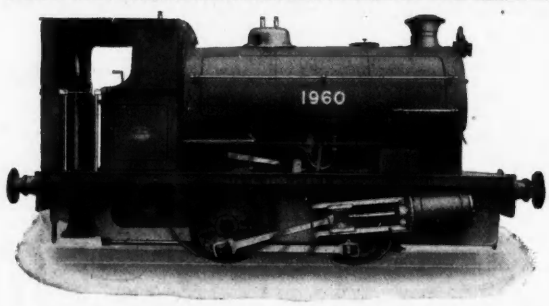

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APPOINTMENTS VACANT

PRESTATYN URBAN DISTRICT COUNCIL

APPLICATIONS are invited for the Appointment of TWO TEMPORARY TECHNICAL ASSISTANTS in the Gas Engineer and Manager's Department, at salaries of £350 and £250 per annum, plus a cost-of-living bonus, according to qualifications and experience.

Candidates should be exempt from Military Service and have had Gas-Works training and Drawing Office experience. Preference will be given to candidates with Gas and Water Works training.

The appointment will be subject to one calendar month's notice in writing, on either side, and will be subject to the Council's usual conditions of service.

Applications, with covering letter in candidate's own handwriting, stating Age, Experience, Qualifications and date when services would be available, and accompanied by *copies* of three recent Testimonials, must be delivered, *suitably endorsed*, to Mr. S. Trevor Roberts, M.Inst.M.&Cy.E., Engineer and Manager, Municipal Buildings, Prestatyn, not later than noon on Wednesday, June 18, 1941.

Canvassing in any form will be a disqualification.

J. LLOYD HUGHES,
Clerk to the Council.

Municipal Offices.
May 29, 1941.

(Continued on p. 406)

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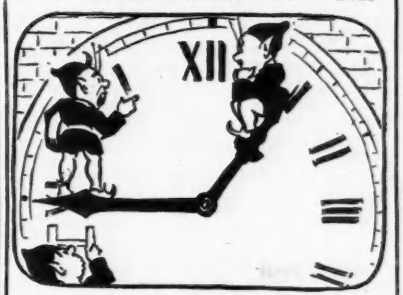

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INDUSTRIAL Furnace and Factory Installation Engineer requires position. Manufacture of Heat Treatment Appliances burning Gaseous, Liquid, and Solid Fuels. Also all mechanical plants, pressure systems and services for the above. Age 37 years. 21 years' experience in this industry. Keen on production and factory installations.

Address No. 9129, "GAS JOURNAL," 51, High Street, Esher, Surrey.

APPOINTMENTS VACANT

(continued from p. 405)

MORLEY GAS COMPANY

APPLICATIONS are invited for the Position of TECHNICAL ASSISTANT to the above Company at a Salary of £250 per annum, plus the appropriate cost of living bonus (at present 15s. per week).

Preference will be given to applicants having experience of gas distribution and industrial gas, and some drawing office experience. Candidates should not be liable for military service, and the position will be a permanent one for a suitable man.

Applications stating Age, Experience and Qualifications, together with *copies* of Testimonials, should be received by the undersigned not later than June 9, 1941.

HAROLD PICKLES,
A.M.Inst.C.E., F.C.S.,
Engineer and Manager.

Gas Offices,
Queen Street,
Morley, Yorks.

COUNTY BOROUGH OF BIRKENHEAD

(GAS DEPARTMENT)

WORKS MANAGER

APPLICATIONS are invited for the Position of WORKS MANAGER at a Salary of £475 per annum, plus war bonus.

Applicants must have had sound technical and educational training in the practice of gas manufacture, and possess both engineering experience and practical gas-works experience; must be good disciplinarians, and preferably have passed the Higher Grade Examination of The Institution of Gas Engineers, Gas Manufacture.

The person appointed must contribute to the Superannuation Fund and pass a medical examination.

Applications, stating Age, Qualifications, Experience and Present Position, with *copies* of three recent Testimonials, to be sent to me in sealed envelopes endorsed "Works Manager," to arrive not later than Thursday, June 19, 1941.

E. W. TAME,
Town Clerk.

May 26, 1941.

ASSISTANT MAINS SUPERINTENDENT

A VACANCY exists with a Gas Undertaking in Staffordshire for a Mains Superintendent. During the War period the appointment will be for night duty only. After the War the selected applicant will take full charge of the mains. Salary in accordance with aptitude and experience. All applications treated in strict confidence.

Write, stating Age, Experience, Salary required, and enclosing *copies* of any Testimonials available to G. W. Dennis, Secretary and General Manager, South Staffordshire Mond Gas Company, Dudley Port, Tipton, Staffs.

MAIN AND SERVICE LAYER required by a small undertaking in the South-West. Rate of pay 1s. 7d. per hour. Permanency to suitable man. Apply with details of Experience to No. 9130, "GAS JOURNAL," 51, High Street, Esher, Surrey.

APPOINTMENTS VACANT (ctd.)

TECHNICAL ASSISTANT

APPLICATIONS are invited for the above position by a Company producing about 700–800 million cubic feet gas per annum.

Candidates should be Gas-Works trained, reserved from military service, and possess the Higher Grade Certificate (Manufacture) of the Institution of Gas Engineers or equivalent qualifications.

Ability to take control of carbonizing, benzole and concentrated liquor plants, perform routine chemical tests and some drawing office work is required.

Applications stating Age, Experience, Qualifications and Salary required (not less than £300 per annum), together with *copies* of two Testimonials to be sent to No. 9131, "GAS JOURNAL," 51, High Street, Esher, Surrey, not later than June 28, 1941.

SELBY URBAN DISTRICT COUNCIL

(GAS DEPARTMENT)

TECHNICAL ASSISTANT

APPLICATIONS are invited from persons not liable for military service for the Position of TECHNICAL ASSISTANT at a salary of £234 per annum, with free house, coal and gas. Applicants must have a thorough knowledge of carrying out usual Gas-works repairs and have practical experience in the control of Vertical Retorts (Drake's type an advantage).

The position is a designated post under the Local Government and other Officers' Superannuation Acts, and the successful candidate will be required to pass a medical examination.

Applications, in sealed envelope endorsed "Technical Assistant," stating Age, Married or Single, Experience, Qualifications and accompanied by *copies* of not more than three recent Testimonials, to be received by the undersigned not later than Wednesday, June 11, 1941.

C. C. CAREY,
Clerk to the Council.

Town Hall,
Selby, Yorkshire.

ROYAL BURGH OF DUMFRIES

(GAS DEPARTMENT)

APPLICATIONS are invited for the Appointment of a WORKS ASSISTANT. Wage £5 10s. per week, plus cost of living bonus. Applicants must be practical engineers and be experienced in gas manufacture and distribution. The post is a designated one for superannuation purposes. Age not to exceed 45.

Applications, marked "Works Assistant" on the outside of the envelope, with *copies* of Testimonials must be lodged with the subscriber on or before Monday, June 16, 1941.

J. HUTCHEON,
Town Clerk.

Municipal Chambers,
Dumfries.

June 2, 1941.

APPOINTMENTS VACANT (ctd.)

WANTED, EXPERIENCED STOKER for 500 million Works in Surrey. Preference given to man with experience in vertical as well as horizontal retorts. Wages 11s. 10d. per shift (including War Bonus). Permanence for suitable man. Apply to the Manager, Yorktown and Camberley Gas Company, Camberley, Surrey.

TECHNICAL ASSISTANT

APPLICANTS for the above position under No. 9117 are thanked and notified that the MATTER IS NOW CLOSED.

PLANT &c. (Second Hand) FOR SALE & WANTED

'PHONE 98 STAINES.

FOR SALE.—Weir Feed Pump 10½ in. by 8 in. by 24 in.; Large Calorifier 7 ft. by 3 ft., Indented Tubes; 5 in. by 8 in. Three throw Pump; 3 in. Electric Centrifugal Pump 415/3/50; Cylindrical Tar Tank 32 ft. by 5 ft. 6 in.

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FOR SALE.—One 135 h.p. Crossley Horizontal Twin Cylinder Gas Engine, flexibly coupled to 80 k.w. 220 volt Crompton D.C. Generator; complete with cooling tank, pump, gas fans, &c.

Two 47/52 b.h.p. Horizontal Single Cylinder Gas Engines by Crossley; speed 270 r.p.m.; 12 in. bore by 20 in. stroke; flywheel 7 ft. 2 in. by 6 in. face; with belt pulley 45 in. dia. by 20 in. face. George Cohen, Sons & Co., Ltd., Wood Lane, London, W. 12.

A small gas company requires a suitable plant to augment the coal carbonizing plant, capable of producing 30,000 cubic feet of not less than 300 B.Th.U. per day. Second-hand plant would be considered. Address No. 9132, "GAS JOURNAL," 51, High Street, Esher, Surrey.

WANTED, ANTI-DIP VALVES, either Simmonds' or Cort's. Cannock District Gas Company, Ltd.,Cannock, Staffs.

SURPLUS PLANT & MACHINERY URGENTLY REQUIRED; Diesel Engines, Steam Engines, Boilers, Pumps, Hydraulic Plant, Electric Generating Sets and Motors, Locomotives, Cranes, Sheet Metal Working Machinery, Piping, etc. All are needed for work of the most urgent National importance. If you have any such plant in your Works, please offer it to us.—**GEORGE COHEN, SONS & Co. Ltd., Wood Lane, London, W. 12 (Shepherds Bush 2070). Stanningley, nr. Leeds (Stanningley 71171). And at Birmingham, Sheffield, Manchester, etc.**

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